THE EFFECTS OF CULTURAL DISPOSITIONS ON BEHAVIOR IN SOCIAL DILEMMAS: EXAMINING THE IMPACT OF EXPECTATIONS ON COOPERATION AND COMPETITION

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ABSTRACT

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Many groups require cooperation in order to efficiently complete tasks in a manner that benefits all group members. The antecedents of cooperative and competitive behavior have been well studied using a particular class of problems called social dilemmas. Cultural variables, such as collectivism, are often thought to influence cooperative behavior in groups, but experimental evidence has seen mixed results. The current study attempts to add to our understanding of the effects of cultural variables on cooperative and competitive behavior in groups by advancing two major ideas: (1) that the Input-Process-Output (I-P-O) framework–a theoretical framework of group functioning which proposes that group members' individual characteristics, dispositions, etc. influence the processes of groups when interacting which, in turn, impact the outcomes the group produces–can be used as a conceptualization for understanding the impact of cultural variables on potential group outcomes, provided that a distinction is made between potentially meaningful but task-unrelated distal inputs such as collectivism and task-related proximal inputs, and (2) that group process can be indexed using variance components calculated from the Social Relations Model (SRM)–a statistical tool used to analyze dyadic data. Using two social dilemmas as experimental media, participants were placed in groups of four and asked to report what they expected each of their group members to do during the social dilemmas and how much they trusted each of their fellow group members. Results demonstrate that collectivism increases the tendency to expect similar behavior from fellow group members and to trust fellow group members at similar levels when given little diagnostic

information. In turn, more competitive behavior is demonstrated in groups that have members who all expect similar behavior from each group member, but show variability regarding what the behavior will be. The study demonstrates (1) a significant relationship between collectivism and expectations of other group members' behavior, (2) expectations will synthesize into meaningful variance components as calculated using SRM, (3) SRM variance components serve as useful indicators of group process and, (4) SRM variance components can be used to predict cooperative and competitive behavior in social dilemma situations. This research demonstrates the value of using SRM variances as indices of process and underscores the theoretical utility of the I-P-O framework as an explanatory tool of group behavior.

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INTRODUCTION

In the documentary film *The Fog of War*, Robert McNamara–the U.S. Secretary of Defense during the Cuban Missile Crisis–offers the advice that complete rationality will not always lead to the best decisions. While many classic theories of decision making support the notion that rational decision making is a desired goal (Savage, 1954; von Neuman & Morgenstern, 1947), modern theoretical perspectives in decision making research state that rational action is not necessarily required for quality decisions to be made (Gigerenzer, 2004; Simon, 1956). Indeed, what is purely rational for one decision making party could potentially lead to collective catastrophe. McNamara recalls that during meetings in which leaders of the United States were deciding the appropriate response after discovering missiles in Cuba, those that supported escalating the conflict had rational arguments for doing so. However, if the United States and Soviet Union had followed such advice, the resulting actions could have triggered a nuclear war which would have created disastrous consequences for the entire planet.

McNamara seeks to teach the lesson that there are times when rational individualistic decision making can have potentially disastrous consequences for the collective. He ends by offering hope for the future that we will learn from the mistakes of the Cuban Missile Crisis and reduce stockpiles of nuclear weapons. The crisis itself demonstrates the increasing importance of understanding decision making processes across cultures. The United States and the Soviet Union had very different political, economic, and cultural systems that could have contributed to differences in how the important decisions were made. However, the Cuban Missile Crisis is not the only example of a problem in which conflict across nations can have potential consequences for the entire

world. Overharvesting fishing resources in one section of the ecosystem may increase profits for a single fishery, but may also completely remove a species from the ecosystem. Greenhouse gasses emitted by one country can lead to climate change, which may impact the crops a farmer can plant in the future (Wade-Benzoni & Tost, 2009).

By understanding the conditions in which collective good is emphasized over individual good, we may be able to better understand the nature of some great problems facing our planet. Of potential interest is the ability of variables shown to differ across nations to help explain when someone will be more inclined to choose an option that benefits the individual as opposed to the collective. One well researched topic of interest within the field of cultural psychology addresses the distinction between societies that promote the individualistic good and societies that promote the collective good (Markus & Kitayama, 2003; Matsumoto & Yoo, 2006). We hope to show that factors demonstrated to differentiate nations within the field of cultural psychology can be important indicators of when collective cooperation is emphasized over individualistic competition in group settings.

Theoretical Approaches to Cultural Differences

We will begin our discussion of the study of culture within psychology with the seminal work of Hofstede (1980). In this work, Hofstede presents an analysis of survey responses to the working environment made by employees within a multi-national corporation. A factor analysis of this survey demonstrates five distinct factors which tend to differentiate nations. Those factors include: (1) power distance–the extent to which hierarchies are established and followed, (2) uncertainty avoidance–the extent to which the unknown is tolerated, (3) individualism-collectivism–the extent to which individual or

collective motives are emphasized, (4) masculinity-femininity–the extent to which the society values professions and practices that are traditionally, from a Western European perspective, reserved for men and women, and (5) long vs. short-term orientation–the extent to which the society values immediate or future rewards. At its core, this research represents a very dispositional approach to culture (Markus & Hamidani, 2007). And while dispositional cultural variables have been shown to predict behavior (Ladbury & Hinsz, 2009; Shuper, Sorrentino, Otsubo, Hodson, & Walker, 2004), this perspective has come under fire for being ambivalent with regard to the effects of context in its understanding and conceptualizing regarding culture. Theory and empirical research have thus grown beyond Hofstede's initial foundation to establish a framework of culture that goes beyond measurement of individual differences.

Research on culture has seen a remarkable increase in attention since Hofstede's conceptualization. Increased research attention has also lead to a number of theories used to describe and explain culture. Culture has been viewed as an aspect of identity that is shaped by socialization (Markus & Kitayama, 1991), as a meaning-making element within individual experience (Shweder, 2003), as task-relevant knowledge structures that are activated in the proper context (Hong, Benet-Martinez, Chiu, & Morris, 2003; Hong & Chiu, 2001; Morris & Gelfand, 2004), and as strategies designed to allow the participant to interact effectively with others (Yamagishi, Hashimoto, & Schug, 2008). All these theories propose different mechanisms by which culture impacts behavior.

Markus and Kitayama (1991, 2003) propose that culture impacts behavior through the self. They argue that the method by which individuals within a culture establish their identity creates distinct differences across cultures. According to their theory, societies

differ on the individualism-collectivism dimension because individuals within the society differ on how they construe their identity. Individuals in individualistic cultures base their identity on internal, trait-like qualities–which is termed an independent self-construal. Individuals from collectivistic societies base their identity on the relationships they engage in–they are said to have an interdependent self-construal. The idea that cultural differences are driven by differences in self-construal has been a remarkable catalyst into research regarding cultural differences, particularly differences that occur between cultures in East Asia and those with Western European roots (Matsumoto & Yoo, 2006). However, this perspective has little to say regarding the effect of person by situation interactions that occur regularly within the experimental literature (Markus & Hamidani, 2007).

Others have proposed that culture impacts behavior through the activation of culture specific knowledge structures (Hong et al., 2003). These structures are engaged by the situation the actor is in and thus, cultural effects will only occur if the situation engages the proper cognitive mechanism (Hong, Morris, Chiu, & Benet-Martinez, 2000). Essentially, culture is treated as an interaction between the person and the environment, with special attention to the person's experience within the environment and the cultural relevance given to symbols within the environment. For example, it is known that Chinese tend to categorize objects differently than Americans. Chinese tend to categorize according to relationships whereas Americans tend to categorize according to basic features. If asked whether a carrot or a cat belongs with a rabbit, Chinese tend to place the rabbit with the carrot because rabbits eat carrots whereas Americans tend to place the rabbit with the cat because they are both mammals (Chiu, 1972). Bilingual individuals tend to switch between these two modes of processing depending on whether or not the study is administered in

Chinese or English. Chinese bilinguals that complete the task in English tend to categorize more like Americans than if asked to complete the task in Chinese (Ji, Zhang, & Nisbett, 2004). These studies make important contributions to the study of culture by demonstrating the situational nature of cultural effects and demonstrating that context is important for determining when cultural variables will affect behavior.

A recently proposed theory of culture states that culture impacts behavior based on the strategies for solving problems that are deemed appropriate based on the situation (Yamagishi, et al., 2008). In a test of this theory, the researchers demonstrate a greater preference for uniqueness among Americans compared to East Asians (Kim & Markus, 1999). In that study, Americans and East Asians are asked to select a pen as a reward for completing a survey. The participant is given the option of selecting one of five pens. Four of these pens were of the same color and one of the pens has a unique color. East Asians tended to prefer the common colored pens and Americans tended to prefer the unique color pens (Kim & Markus, 1999). However, Yamagishi, et al. (2008) showed cultural differences tend to disappear by clearly defining the number of people that would select pens after the participant finished making a selection. When Japanese and Americans believed they were the first person among a number of people to select a pen, both tended to prefer the common colored pen. Similarly, all participants tended to prefer the unique colored pen if they were led to believe that they were the last participant to choose and there simply happened to be five pens remaining. The effect of culture was demonstrated to occur because of a difference in how the situation is construed between people in the United States and Japan. It is proposed that in the original study, Americans assumed they would be the final person to select a pen. However, the Japanese in the

original study made the opposite assumption. They were more likely to assume that more people after them would also be asked to select a pen. In this case, the difference in behavior occurs not because of a preference for uniqueness vs. similarity as originally proposed but rather a difference in the perception of the position one is in.

Such research establishes a different direction for research examining cultural differences. Rather than focusing on differential perceptions (Kitayama, Duffy, Kawamura, & Larsen, 2003) or the extent to which different modes of thinking are emphasized (Nisbett, Peng, Choi, & Norenzayan, 2001), this approach focuses on the differential use of strategies that will enable the participant to understand what to expect from a situation and plan accordingly. This conceptualization is not necessarily new to studies of cross-cultural differences. Yamagishi (1988) established that Japanese participants adopt very different strategies compared to Americans when asked to solve a classic social dilemma known as the public goods dilemma. The dilemma asks participants to contribute some amount of an endowment to the creation of a group bonus. If enough people contribute, a bonus is provided to everyone regardless of whether they contributed or not. Americans contribute approximately 56% of their endowment to the establishment of a public good. However, Japanese participants actually contributed significantly less to the establishment of the good than did American participants–about 44% of their endowment. The effect was moderated, however, by the establishment of a sanctioning system. If an effective system for sanctioning free-riders existed, Japanese participants contributed more to the public good than did American participants (90% vs. 80% of the endowment, respectively). Japanese participants were expected to contribute more to the creation of the public good regardless of condition because of greater expected

collectivism. However, based on this pattern of results, it was concluded that Japanese participants were more reliant on external forces to regulate behavior. In contrast, the individualistic American participants may have relied on internal mechanisms such as guilt or a sense of fairness applied to all individuals to regulate their behavior. Thus, behavior in this situation was markedly different, not because of a different construal of the situation, but because of a reliance on different strategies in an effort to solve the problem.

By framing the study of culture as a difference in the use of strategies, research on culture can take an interesting new direction. Cultural differences become reflected in differences in interpersonal expectations. The important element of culture is not represented in a dispositional difference or in a difference in how individuals construe themselves or the situation which they find themselves in–though these elements will change their behavior in the final assessment. Rather, culture is a method by which individuals come to understand what they can expect from their interactions with others and their environment.

Dispositional differences such as individualism and collectivism will certainly have an impact on expectations for individual behavior. Imagine that two collectivists are playing a game in which they can both contribute to an investment fund. The amount of the investment in the fund is doubled and the rewards are split among both parties. Our two collectivists may use their own disposition as an anchor point when attempting to discern whether or not their partner is trustworthy enough to contribute a large sum of their own endowment to the investment game (Chambers & Windschitl, 2006). They may both infer that the other will construe the situation as one of mutual cooperation, which will lead to their contributing a large sum of money to the investment fund, which will in turn

reinforce their trust in their partner and their collectivistic notions in general. An individualist and a collectivist playing the same game could potentially have vastly different expectations regarding their partner's behavior. The collectivist may assume that the individualist will contribute to the collective good, since the collectivistic mindset involves an expectation that the communal good should be rated as more important than the individual good. In contrast, the individualist may assume that the collectivist will play the game as the individualist will, attempting to advance personal goals. In this game, collectivists would then contribute a large sum of their endowment to the investment while individualists would hold most of their endowment. The initial result would be greater initial gains for individualists. However, after the first round of the game, collectivists may become disillusioned with the idea of adding to the individualists' resource pool without an accompanying gain for themselves and contribute far less to the investment during subsequent iterations. Thus, one may observe a pattern of behavior in which collectivists contribute less to the overall public good compared to individualists.

The conceptualization of culture as expectations from interactions–both from others and the environment adds to our current conceptualization of culture in a number of ways. In particular, an expectations approach introduces a mechanism that can be socialized, influenced by experience, and impact behavior. Moreover, this example demonstrates that games may be an important vehicle for use in the study of culture. The study of games, and in particular a class of games known as social dilemmas, has promise for enhancing our understanding of the impact culture can have on individuals and how individuals may impact their culture.

Social Dilemmas

Social dilemmas are a particular class of problem in which individuals making decisions can choose to act in an individualistic manner and serve their own good, or to act in a cooperative manner and ensure the collective good. Within social dilemmas, it is individually rational for each decision maker to act in a non-cooperative manner. However, if all interaction participants act in an individually rational manner, the collective will be worse off compared to if everyone cooperated (Komorita & Parks, 1996).

Social dilemmas that involve groups usually follow the classic "tragedy of the commons" (Hardin, 1968). In the tragedy of the commons, everyone with livestock is able to graze their cattle on a common area of land. The land can support a finite number of animals grazing on it before the resource completely collapses. In this situation, the cost to each party of adding one more animal to the herd is minimal. Adding one more animal to the grazing land is unlikely to cause the resource to collapse but will increase the party's profits. However, if all parties attempt to increase their profits in the same way, the resource will quickly collapse from the excess number of animals added to the commons.

In the laboratory, social dilemmas such as the tragedy of the commons are often studied using games. Two types of games routinely used to study social dilemmas fall under two categories, public goods games and resource allocation games. Both of these types of games mimic the conditions that occur within the tragedy of the commons, but do so in different ways.

Public goods games require a minimum investment by a group of individuals to receive a reward which will then be given to all individuals regardless of how much each individual contributed. They are called public goods games because the games mimic the

creation of public goods–goods requiring a minimum investment by the public that, once provided, cannot have access restricted. An example of a public good is American public television. Broadcasters of public television require a certain amount of funding before they can operate which is generally provided by the public. Once that level of funding is reached, everyone can watch public broadcasts regardless of whether or not they contributed to the station or not. In this situation, the individually rational action is to avoid contributing to public broadcasting. If this action is taken, the individual has incurred no cost and can still enjoy programming free of charge. However, if everyone acted in an individually rational manner, public broadcasting would not receive any funding and would not be able to continue operating, in which case no one would receive the good.

In the laboratory, public goods games can take the form of an investment type game (Parks & Vu, 1994; Yamagishi, 1986, 1988). Each member of a group is endowed with a particular sum of money. In some cases, the participant must choose to contribute their entire endowment to the creation of a public good or to keep it for themselves. If the number of contributing group members exceeds a pre-determined number, the public good is provided–usually in the form of a bonus–which is then split among all group members. Other cases of the public goods dilemma allow for a more continuous contribution by the group members. In such a case, the group members are all endowed with an amount of a resource and can contribute any amount of their resource towards the fulfillment of the public good. If a particular threshold of contributions is reached, the public good is provided and the bonus is split equally among all group members.

Resource allocation games are similar to public goods games in that they involve groups and require collective cooperation to receive the greatest rewards. The difference between them is that resource allocation games are played in the reverse of public good games (Komorita & Parks, 1996, Parks & Vu, 1994; van Dijk & Wilke, 1995). In resource allocation games, the group begins with a single pool of resources. Each member of the group is given the opportunity to harvest some of the resource, but not so much that they could individually exhaust the entire pool. If the level of the resource remains above a pre-determined level, the group is provided with a bonus which is split equally among all group members.

The conditions for a social dilemma exist in this situation as well. If all members of the group act in a cooperative manner and conserve the resource, they will gain bonuses which, over time, result in greater total rewards. However, the individually rational action is to take more of a harvest than the other players. Doing so insures the person a greater pay-off regardless of the actions of the other players. If the other players choose to conserve the resource–the cooperative action–the player harvesting more of the resource will gain all the benefits of harvesting and will benefit from the bonus which is given to all group members equally. If the other group members also decide to harvest more of the resource than can be sustained, the player will gain the most rewards by harvesting as much of the resource as possible while the resource pool is still viable.

Other versions of resource allocation games exist in which the group does not necessarily receive a bonus for remaining below the harvesting threshold, but there is collective incentive to harvest fewer resources none-the-less (Hine & Gifford, 1997; Wade-Benzoni, et al., 2002). In these cases, the amount of the resource remaining in the

collective pool is multiplied by a constant factor after all participants have taken their harvest from the resource. If participants collectively choose a harvest level which will allow the resource to replenish itself, they can gain maximum rewards over a number of trials. However, if participants choose the individually rational option and harvest more for themselves than the resource can replenish, the resource will eventually collapse resulting in fewer rewards for everyone.

Resource allocation dilemmas and public goods dilemmas are mathematically similar. In both cases, a predetermined number of resources must be in a collective pool at the end of each round of the game in order for the group to receive additional rewards for completing the task. However, the elements within each task participants choose to focus on are quite different and affect different psychological processes. Especially important for the outcome of the task is how the participants construe the game. Dawes (1980) discusses how public goods games and resource allocation games can be construed differently. Standard public goods games are usually presented as a "give-some" game–in which the object of the game is perceived to be to give enough resources to create the public good and achieve the bonus. In contrast, the standard resource allocation game is most often presented as a "take-some" game in which the object is to remove resources from the collective pool in a strategic and responsible manner.

Participants that construe a public goods game as a give-some game tend to focus on how much each individual can contribute (van Dijk & Wilke, 2000). They tend to believe that each person should contribute an amount in proportion to a total endowment. Therefore, if some participants are able to contribute more to the creation of the public

good, those same participants are expected to contribute more to the creation of that good in proportion to their total ability. Thus, behavior tends to follow a "proportionality rule".

Participants who play a resource allocation game construed as a take-some game tend to focus on an equal distribution of final outcomes. If some group members receive more of a reward from harvesting than others or some are able to contribute more than others, all group members are expected to harvest or contribute in such as way that everyone ends the game with an equal amount of rewards. Thus, behavior tends to follow an "equal final outcomes" rule.

Construal of the game represents an important point in which culture, and particularly collectivism, may impact behavior. Collectivists are expected to hold greater concern for other members of the group and to be more focused on the behavior of their group members rather than their final outcomes (Yamagishi.1986). Thus, collectivists may be more likely to construe a public goods game as a give-some game and less likely to construe a resource allocation game as a take-some game compared to individualists. One could predict that collectivists would be more likely to follow a strategy in which they believe everyone should contribute to the public good and harvest from the collective resource in accordance with their ability. It is also generally expected that collectivists be more likely to play the game with a focus on collective rather than individual rewards (Levi, 2007, Parks & Vu, 1994). Collectivists are therefore expected to achieve cooperative outcomes more often.

Thus, cultural factors may influence behavior within the social dilemma framework. However, to understand behavior within social dilemmas, we must understand other interpersonal factors that can change whether or not a participant believes it would be

better to cooperate compared to compete. Studies have demonstrated overwhelmingly that one of the most important of such variables is trust.

The Role of Trust in Social Dilemmas

Trust has been shown to be an important contributing factor to behavior in a large number of contexts (Chen, Pillutla, & Yao, 2009; Komorita & Parks, 1996; Mayer, Davis, & Schoorman, 1995, Schoorman, Mayer & Davis, 2007). Within research on social dilemmas, trust is often operationalized as individuals' expectations that their partners will engage in cooperative behavior. Trust is believed to be important because it contributes to an individual's willingness to put oneself at risk of potential losses in exchange for the potential to receive greater rewards (Mayer, Davis, & Schoorman, 1995). Without trust, one becomes unwilling to be vulnerable to exploitation. Choosing to cooperate within a social dilemma framework involves making oneself vulnerable to exploitation by the other player. For this reason, the cooperative option is not the most rational choice from an individual point of view. It is irrational to put oneself in a position to be harmed and thus a rational player should not make such a choice (Nash, 1950; von Neuman & Morgenstern, 1947). However, in part because of a propensity to trust, humans are able to overcome the competitive structure of the situation and tend to cooperate approximately 50% of the time (Camerer, 2003).

Trust is a concept that is easy to discuss and appreciate its importance. For instance, it is easy to understand that people cooperate with one another more than we would expect due to a propensity to trust one another. However, creating a model of trust that accurately predicts when one person will trust another and what effect that trust will have on outcomes has proven to be quite difficult. The greatest difficulty occurs regarding

where to place trust within a broader context of interpersonal interactions and outcomes. Some see trust as an individual difference, in which some people have a general disposition toward trusting others and demonstrate a greater propensity to trust than others (Rempel, Holmes, & Zanna, 1985).

Other conceptualizations place trust within a relationship rather than within a single individual (Mayer, Davis, & Schoorman, 1995). Rather than assuming that trust is a stable individual difference that is applied to all interaction partners equally, Mayer, Davis, and Schoorman's model allows for differential levels of trust across interaction partners, domains and contexts (Schoorman, Mayer, & Davis, 2007). The truster's general disposition towards trust is a component of their model, but the ability of the person's interaction partner to trust is also considered. The dispositional component of trust, in their conceptualization, is a product of three factors, the trustee's ability to complete the assigned task, the benevolence the trustee displays, and the integrity the trustee shows. Note that even though this is an individual difference measure, it takes into account that some tasks will elicit the person to trust their partner more than others. In addition, the model seeks to establish a reciprocal relationship between the truster's level of trust in the trustee and the trustee's level of trust in the truster. The model acknowledges that an individual may display more trust of their interaction partner simply because their interaction partner trusts them. Thus, the trustee's level of ability, benevolence, and integrity are expected to influence whether or not the truster displays a willingness to trust the trustee.

Placing trust within a relationship changes the nature of the question regarding the effects of trust. Rather than being a difference among individuals that can be measured by

a scale, trust becomes a process that occurs as a result of the perceptions and interactions of participating parties. The relationship processes that establish whether or not the parties will develop a trusting relationship are then believed to influence behavioral outcomes. However, when it comes to process, direct measurement is often cumbersome. Additionally, attempts to assess a process such as trust can potentially change the process that would have been used if one were not attempting to measure process at all (Kozlowski & Ilgen, 2006). This makes directly testing the implications of the interpersonal model of trust more difficult than testing dispositional models of trust. The limits of direct assessments of process approaches to trust suggest that inference may be our best method of understanding exactly what processes are occurring within the group situation (Weingart, 1997). Particularly interesting is the potential for the social relations model (SRM; Kenny, 1994; Kenny & La Voie, 1984) to illuminate portions of process that would have been unavailable without the aid of SRM.

The Social Relations Model and Inferring Process

The social relations model (SRM) is a statistical method for analyzing dyadic data–data in which multiple individuals within a group report on a number of interaction partners. One common strategy of data collection involves a round-robin format in which everyone within a group reports on every other member of the group (Kenny, Kashey, & Cook, 2006). Data can then be arranged as a matrix with rater along one axis and ratee along the other (see Figure 1).

The matrix of data is then used to calculate four parameters; the group mean, the actor effect, the partner effect, and the relationship effect (see Appendix A for formulae). Effects are individual level parameters that when combined with the group mean will add

up a single cell of data within the original matrix. Each person in a group has a different actor and partner effect and each pairing of group members has a different relationship

Group Generating a Large Actor Variance

		Ratees			
		#1	#2	#3	#4
Raters	#1		50	50	50
	#2	35		35	35
	#3	20	20		20
	#4	1	1	1	

Group Generating a Large Partner Variance

		Ratees			
		#1	#2	#3	#4
Raters	#1		20	35	50
	#2	1		35	50
	#3	1	20		50
	#4	1	20	35	

Figure 1. Sample data showing a group that would generate a large actor and large partner variance. Numbers within the cells represent a numerical assessment made by the rater about the ratee ranging from 1-50.

effect. To arrive at Group Member #1's rating of Group Member #2, one would take the group mean and then add Group Member #1's actor effect, Group Member #2's partner effect, and the relationship effect for the pairing of Group Members 1 and 2. If data is collected at a single time point, the relationship effect also contains error.

The actor effect represents the tendency of a single rater to rate all interaction partners similarly. In other words, it measures the extent to which the person doing the rating impacts the ratings of all group members and can be thought of as the "row effect" in Figure 1. Notice that in the top half of Figure 1, Group Member #1 rates Group Members 2, 3, and 4 the same as does Group Member #2, etc. If the dependent variable of interest was the personality variable extraversion, for example, an individual with a large actor effect would perceive all interaction partners as equally extraverted. The partner effect represents the tendency for a single individual to be rated consistently by all interaction partners. It can be thought of as the "column effect" in Figure 1. Notice that in the bottom half of Figure 1, Group Member #1 is rated the same by Group Members 2, 3, and 4. Continuing the extraversion example, someone with a large partner effect may act in an extraverted manner which would lead to all interaction partners rating that person as very high on extraversion. Finally, the relationship effect represents the unique aspects of a relationship that may develop between pairings of individuals. For example, two people may have prior knowledge of one another that could impact their expectations of what each other will do independently of their interaction within the study. This variation would be captured by the relationship effect. The relationship effect can only be separated from measurement error if multiple assessments are made over the course of data collection (Kenny, 1994).

Once individual level effects have been calculated, the analysis moves to the group level. One calculates the variance associated with the actor, partner, and relationship effects within each group. The variance of the actor effects is referred to as actor variance, the variance of the partner effects is referred to as partner variance, and so on. Groups with large actor variances contain group members that believe all group members will respond similarly but will have different beliefs regarding the level of responding (see top half of Figure 1). Groups with large partner variances will all agree on which group member are high and low on the measure of interest (see bottom half of Figure 1). Assessing these variance components over multiple groups allows the researcher to establish statistically the average amount of each type of variance within a sample of groups and to establish whether or not that variance is statistically significantly different from zero. For ease of interpretation, the percentage of total variance accounted for by each variance component is generally reported (Kenny, Kashey, & Cook, 2006; Bergman, Small, Bergman, & Rentsch, 2010).

Using SRM, one can generate multiple indices that can be used as summaries of the inferred process that occurred within the group as it arrived at the final outcome. Actor, partner, and relationship variances are the primary indices calculated using the model but others exist as well. For example, one can collect self-ratings in addition to ratings of all interaction partners. Continuing the example with extraversion, one would ask participants to rate their own level of extraversion in addition to the extraversion of their interaction partners. Self-ratings of extraversion could then be correlated with the individual-level actor effects to arrive at a measure of assumed similarity. A high correlation between self-ratings and actor effects would indicate that the person believes their group members are

just as extraverted as the individual is. Self-ratings can also be correlated with individual-level partner effects to create a measure of self-other agreement. Large correlations in this measure would indicate participants believe themselves to be as extraverted as their interaction partners believe them to be.

The social relations model has been proposed as a method for inferring and indexing group process (Ladbury & Hinsz, in press; Rentsch & Woehr, 2004) in that the processes related to social interactions can be described in terms of variance in the judgments of interacting parties. The total variance in judgments about a social interaction can be explained as (a) actor variance, the tendency for one party to believe all interaction partners will behave similarly, (b) partner variance, the tendency for group members to rate each individual similarly, and (c) relationship variance, the tendency for unique information between two interacting parties to be used when making judgments that results from expectations and beliefs that the actor and partner have regarding one another. By calculating quantifiable descriptions of each variance component, we may be able to infer more about the process the group is using and also understand how those processes lead to the outcomes that are observed.

One conceptual framework, the Input-Process-Outcome (I-P-O; McGrath, 1964) framework, proposes that group outcomes are a function of processes that occur within the group which are themselves a function of group member inputs. These inputs can be characteristics of the members such as personality factors, special skills, cultural disposition, or individual differences in trust. This conceptual framework implies that process mediates between group member inputs and group outcomes. The fact that the SRM variance components are normally distributed numerical observations allows for a

more stringent test of the meditating link between inputs and outcomes suggested by the I-P-O framework that other methods of inferring process cannot achieve.

SRM represents a statistical method which can be used to create a quantifiable estimate of group process. Giving a numerical measurement to group process allows for important questions to be considered. First, it allows us to understand the factors that lead to particular group processes. As an example, trust may be a concept that occurs at the group level or at the individual level. If a violation of trust to one group member represents a violation of trust to the entire group, large partner variance on measures of trust would be expected because all group members would agree on the trustworthiness of members that violate or uphold trust. However, if trust is more important at an individual level, we would expect to see larger actor variance if the rater uses his or her own trustworthiness as a way to gauge trust in others, or larger relationship variance if unique information about each group member is taken into account when determining whether or not to trust that person. This information can then be used to determine whether or not group processes predict group outcomes and, if so, which specific processes predict specific outcomes.

Hypotheses

The underlying model to be tested in the proposed research is presented in Figure 2.

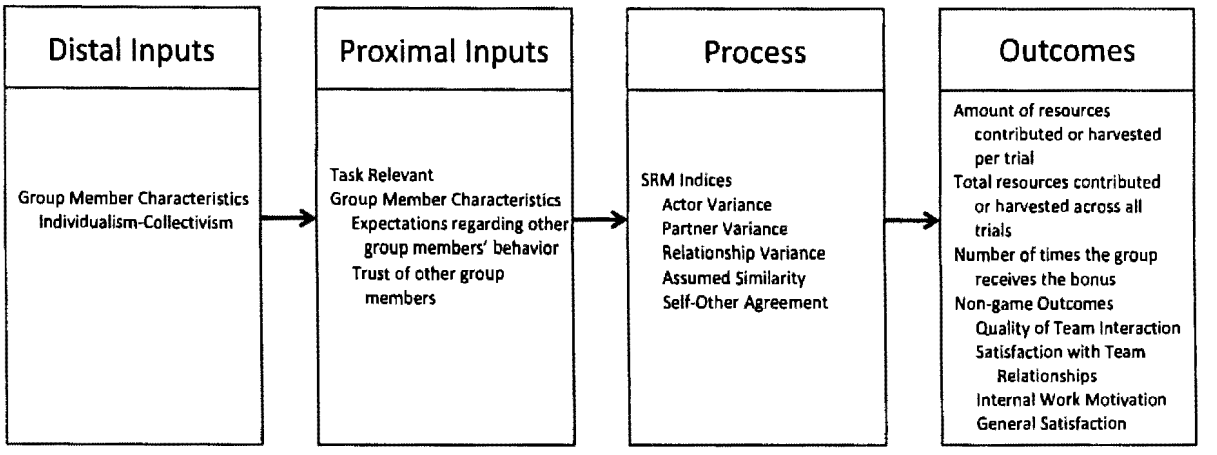

Figure 2. Basic model to be tested

Distal inputs are aspects of the individual group members that are expected to relate to task-relevant proximal inputs, which in turn will affect process, which will ultimately affect outcomes. Figure 2 represents the conceptual model that will be used to frame our analyses. There are a number of relationships stated and implied by the figure. The basic analyses proposed in the model are that distal inputs–namely individualism-collectivism–will relate to proximal inputs–the SRM effects associated with the group member's expectations regarding their interaction partners' behavior and the group member's perceptions of trust in their interaction partners. The link between proximal inputs and process indicates that it is expected that groups will have meaningful variability in their SRM effects. In other words, the sample of groups is expected to have SRM variance components that are statistically different from zero, indicating systematic responding at the group level. Finally, Figure 2 shows that it is expected that the SRM variance components will relate to group level outcomes including resources contributed or harvested, the satisfaction of group members with the group, and the internal work motivation of the group members. Following the logic of the figure, the following relationships are implied; distal inputs will relate to outcomes, proximal inputs will mediate the relationship between distal inputs and process, and process will mediate the relationship between proximal inputs and outcomes.

To provide some context for the following hypotheses, the study will involve four-person groups responding to a public goods or resource allocation dilemma. The dilemma will involve the parties deciding how much of their individual resources to invest in the public good or how much of their collective resources to harvest from a collective pool with the potential to receive a bonus if the public good is provided or the collective harvest

is below a critical threshold. To test a number of notions discussed previously, the following hypotheses are offered. To organize the hypotheses, those numbered 1 involve distal inputs as independent or predictor variables, those numbered 2 involve proximal inputs, and those numbered 3 involve indices of process as predictor variables.

It is expected that those high in collectivism will play the game for the collective good and those low in collectivism will play the game for the individual good. This represents the basic hypothesis offered by this study. Highly collectivistic individuals are expected to act in the best interest of the collective. Therefore,

Hypothesis 1a. Groups with members high in collectivism will contribute a greater amount of resources in the public goods game and will harvest fewer resources in the resource allocation game compared to groups with members low in collectivism.

In addition to the behavior proposed by Hypothesis 1a, group members high in collectivism will also expect their interaction partners will play the game for the collective good. Group members low in collectivism will expect their interaction partners will play the game for their individual good. This hypothesis tests the relationship between distal, non-task related inputs and proximal, task related inputs.

Hypothesis 1b. Group members high in collectivism will be more likely to expect all group members will give the same contribution in the public goods game and all group members will take the same harvest in the resource allocation game.

This hypothesis would be manifest within the data by collectivism being positively correlated with actor effects associated with expectations. This hypothesis implies that

individuals high in collectivism will perceive their interaction partners' behavior as more uniform. This prediction is made using the theory that self identity and collective identity become intertwined within the collectivistic mindset (Markus & Kitayama, 1991; Yuki, 2003). This prediction also follows from the expectation that individuals high in collectivism will be more likely to construe the public goods game as a give-some game and less likely to construe the resource allocation game as a take-some game compared to those low in collectivism.

In addition, the relationship between a dispositional measure of trust propensity and collectivism will also be tested. Trust propensity is a potential mechanism through which one may achieve more cooperative outcomes among individuals high in collectivism. Therefore, it is expected that participants high in collectivism will show more propensity to trust their group members compared with participants low in collectivism.

Hypothesis 1c. Trust propensity will be positively related to collectivism.

Finally, we also expect that collectivism will be related to the more proximal, task relevant aspects of trust. Similar to Hypothesis 1b, it is expected that those high in collectivism will trust their group members more uniformly than those low in collectivism. Thus it is expected,

Hypothesis 1d. Collectivism will be positively associated with actor effects in trust measures. Simply being part of an interacting group is expected to create the conditions necessary for collectivists to place similar levels of trust in all interaction partners.

To test the relationship between proximal inputs and process, we will turn to the SRM using the actor, partner, and relationship effects and their variances as indices of process.

Hypothesis 2a. Groups will begin the games showing actor variance only in their expectations for contributions and harvests. As the game progresses, groups will show increasing levels of partner variance in the measures of expectations.

Hypotheses 2a is predicted because individuals will have limited information on which to base their expectations during the beginning rounds of the games. Making fine-grained distinctions between different group members is likely to be very difficult given the limited information the group members possess about their partners. Thus, the most likely pattern of responses is to expect the same contribution or harvest from all group members, potentially using the member's self-expectation as a guide. Once the game progresses, it is expected that the individual members will then have information upon which they can base their expectations. Thus, expectations are likely to become more consensus based as the games progress and increases in partner variance will result.

In addition to contribution and harvesting behavior, we also expect the trust measures will form reliable SRM indices. SRM indices in this case will be based on perceptions of trust and are independent from indices calculated based on expectations of contribution or harvesting behavior, however the predictions are similar.

Hypothesis 2b. Groups will begin the games showing actor variance in trust perceptions. As the games progress, they will show more partner

variance with actor variance likely disappearing at the end of the study.

The same logic that applies to hypothesis 2a also applies for 2b. Group members will have little information on which to base their perceptions as the games begin. In this case, the most likely pattern of interaction is actor variance appearing at the beginning of the task and partner variance growing larger as the games continue.

Finally, hypotheses can also be generated regarding the potential relationships between SRM indices and group outcomes. Again, SRM indices calculated based on expectations of contribution or harvesting behavior are different from SRM indices calculated based on task-relevant trust measures and involve unique calculations.

Hypothesis 3a. In the public goods game, groups with greater levels of partner variance with regard to expectations of contribution behavior will contribute more to the collective resource pool per trial and will generate more bonuses than will groups with lower levels of partner variance.

Hypothesis 3b. During the resource allocation game, groups with greater levels of partner variance with regard to expectations of harvesting behavior will harvest less of the resource on a per trial basis and will receive more bonuses than will groups with lower levels of partner variance.

Hypothesis 3c. In the public goods game, groups with greater levels of partner variance with regard to task-relevant trust will contribute more to the collective resource pool per trial and will generate more

bonuses for group members than will groups with lower levels of partner variance.

Hypothesis 3d. During the resource allocation game, groups with greater levels of partner variance with regard to task-relevant trust will harvest less of the resource on a per trial basis and receive more bonuses than will groups with lower levels of partner variance.

Partner variance is expected to be the best predictive factor with regard to contributions and harvests because it represents group members achieving consensus regarding their perceptions of each other. If groups gain consensus with regard to what each group member is going to do on the subsequent trial, cooperative group members should be able to compensate for a single group member that wishes to act in an individualistic manner. This could occur as long as the rest of the group members held consensus regarding what the individualistic person was going to do and were not relying on all four members to act cooperatively.

Hypothesis 3e. Partner variance in expectations and trust measures will relate to satisfaction with the group and internal work motivation.

This hypothesis represents the notion that groups that have their trust perceptions validated will be more willing to work with one another in the future. If all group members have an understanding of which group members will contribute more or harvest less or which group members can be trusted and which cannot, the group is essentially predictable. This would mean that the more cooperatively oriented or trustworthy members could generate positive outcomes for themselves even if untrustworthy members exist within the group.

Additionally, the proposed research will explore a number of other relationships regarding indices constructed from SRM assessments. The social relations model includes other indices of assumed similarity and self-other agreement. These SRM indices other than actor, partner, and relationship variance are expected to relate to proximal inputs. However, as very little research has examined the effect of these indices in social dilemmas, no predictions are offered. Rather the relationship between this set of indices, proximal inputs, and processes will be treated as exploratory hypotheses.

METHOD

Design and Participants

The study consisted of a 2 (Collectivism: high collectivism vs. low collectivism) x 2 (Game: public goods game vs. resource allocation game) x 2 (Order: public goods first vs. resource allocation first) design with Game as a repeated measures factor. High collectivism groups (19; 10 resource allocation first and 9 public goods first) and low collectivism groups (18; 10 resource allocation first and 8 public goods first) were created with four participants in each group.

Undergraduate students ($N = 148$) enrolled in psychology courses at North Dakota State University (NDSU) were recruited to participate in this research. Participants were recruited using an online survey utility available exclusively to NDSU students in psychology courses. To be eligible to participate, each participant completed an initial survey on the website prior to coming into the lab. This survey assessed their dispositional qualities of horizontal individualism, vertical individualism, horizontal collectivism, and vertical collectivism (Singelis, Triandis, Bhawuk, & Gelfand, 1995). Each quality is evaluated with an 8-item measure on a 1 (strongly disagree) to 7 (strongly agree) scale. Sample items for the measures include: horizontal individualism, "One should live one's life independently of others"; vertical individualism, "It annoys me when other people perform better than I do"; horizontal collectivism, "It is important to maintain harmony within my group"; and vertical collectivism, "Children should feel honored if their parents receive a distinguished award." Scores on the collectivism measures were summed to create a measure of general collectivism. Scores on the individualism measures were not used to group participants because all participants were drawn from a generally

individualistic culture. Thus, all participants were expected to be generally high on individualism. Participants in the top and bottom third of the distribution on the general collectivism measure were invited to participate in the laboratory portion of the study (cf., Shuper, et al., 2004).

Measures

Individualism-collectivism. A number of personal attributes were assessed during the study. Dispositional levels of individualism-collectivism were assessed using the scale of horizontal and vertical individualism-collectivism (Singelis, et al., 1995). The horizontal and vertical dimension of this scale captures relevant differences between individualism-collectivism that occur along power hierarchies, similar to the power distance component of Hofstede's (1984, 2001) model. Horizontal individualism and horizontal collectivism represent individualism and collectivism one experiences with others of similar social standing such as friends and colleagues. Vertical individualism and vertical collectivism represent individualism and collectivism one experiences with others of different social standing such as family members and employers. Research has shown that collectivism in particular has different effects on cognitions and behavior depending on whether one is measuring collectivism within social groups or collectivism within established power structures such as families (Gabriel & Gardner, 1999).

The measures of horizontal and vertical individualism-collectivism were administered twice, once on the online survey to classify individuals within high collectivism or low collectivism groups before they entered the study and once during the study. The second assessment was used as the measurement of distal inputs in the prediction of proximal inputs. This second assessment also served as a manipulation check

during the study to ensure that high collectivism groups were indeed higher in collectivism than the low collectivism groups (see Appendix B for a complete list of horizontal and vertical individualism-collectivism questions).

Expectations of contribution and harvest. Participants' expectations of their interaction partners' contribution or harvesting behavior were assessed. Expectations were based on what the participant believed their interaction partners would do during the following round. Participants were asked to report on every other group member. The expectations measure asked how many points the participant expected each member of the group would harvest or contribute, depending upon which task they were completing, before each round began. Participants were also asked to report how many points they expected to contribute or harvest themselves during the following round.

Trust. Each participant's perceptions of trust were measured using a measure of trustworthiness (Mayer & Davis, 1999) that was modified slightly to be applicable in a laboratory setting rather than an organizational setting. This measure assesses each component of trust according to the model of trust described by Mayer, Davis, and Schoorman (1995) which describes trust in terms of relationships and task contexts. The measure of trust contains five subscales measured on a 1 (strongly disagree) to 5 (strongly agree) scale. The subscales ask the participant to determine the extent to which each participant has the ability to engage in behavior that engenders trust, is benevolent in regard to motives, acts with integrity, and would be trustworthy in situation in which the truster could not monitor the trustee's actions. Measures of ability, benevolence, integrity, and trustworthiness were asked of each interaction partner. Participants were also asked to report their own level of ability, benevolence, integrity, and trustworthiness. In other

words, these four trust measures were treated as a dyadic variable with self-measures included.

The trust measure also addresses a more general element of the individual's propensity to trust people in general. The trust propensity sub-scale was treated differently from the other sub-scales in that it was assessed only once before any interaction occurred. This was done because trust propensity addresses a general tendency to trust others rather than trusting others based on perceived qualities in the other person. Moreover, participants were only asked to report on their own level of trust propensity and did not answer these questions regarding their interaction partners on this scale. Items were modified slightly to be applicable to the social dilemma context rather than an organizational context (see Appendix C for a full list of questions from this trust measure).

Non-game outcomes. Outcome variables that cannot be directly measured by performance within the games were also measured. Participants completed these measures once all trials of the games were complete. The non-game outcomes established the extent to which the participants were satisfied with relationships within the team, the perceived quality of team relationships, general satisfaction with the outcomes, and the extent to which the participants believed they were internally motivated to continue working. These constructs were measured using scales from the Team Diagnostic Survey (TDS; Wageman, Hackman, & Leman, 2005). Scales were three to five items long and were measured on a 5-point scale from 1 (highly inaccurate) to 5 (highly accurate) assessing how accurate a statement is to their team. As noted by Wageman, et al (2005), the TDS is only appropriate for measuring outcomes at the group level, even though all individuals within the group respond to each item. To achieve group level outcomes, interclass correlations for each

scale are calculated and if the ICC for a scale is significant, individual responses to the scale are averaged across the members of the group to arrive at a group-level measurement of the construct (see Appendix D for a full list of questions used to indicate the other outcomes from group interaction).

Games

Two games were created for this study. One was a public goods game and one was a resource allocation game. For the public goods game, each participant began the game with an endowment of 125 points. They were informed that each person could contribute up to 50 points per round to a central resource pool. If the entire group contributed 125 points or more to the central resource pool each member of the group would receive a bonus of 75 points. Group members would receive this bonus regardless of how many points each group member contributed. After each round, the participants were given feedback regarding each participant's contributions to the resource pool. After receiving feedback, the next round began which had the same restrictions as the previous round, but participants were contributing resources from their current pool rather than a pool of 125 (i.e., if the participant contributed 50 points to the resource pool during the first round and the bonus was not given, she or he had only a pool of 75 points to draw from for the second trial). This procedure was repeated for five rounds. Participants were told at the beginning of the task that every 100 points they accumulated would be worth one entry into a lottery in which they could win prizes of $100 or $50.

The resource allocation game proceeded in a similar manner. However, in the resource allocation game, a pool of 500 points was provided to the group as a collective at the beginning of the game. They were told each group member could harvest up to 50

points from the pool. If the total harvest was 75 points or less, they received a bonus of 75 points per group member regardless of how much each one harvested. The participants harvested resources from the same pool during the next round. Thus, if all four group members harvested 50 points during round one, they would harvest from a pool of 300 points for the second round. After the participants made their decisions, they were given feedback regarding the amount of resources each person harvested. This procedure was repeated for five rounds or until the pool of resources was completely depleted. Again, participants were told at the beginning of the task that every 100 points they accumulated would be worth one entry into a lottery in which they could win prizes of $100 or $50 (see Appendix E for a complete script).

Procedure

Participants were brought into the lab in groups of four. Prior to participating in the study, they were classified based on their responses to the general measure of collectivism which was the combination of their horizontal collectivism and vertical collectivism score measured during the online survey procedure described above. Those high on the collectivism measure (the top third) worked in groups together and those low in collectivism (the bottom third) worked in groups together. Before beginning the study, participants were given a brief description of the study and signed an informed consent form (see Appendix F)

Each group was randomly assigned to complete either the public goods game or the resource allocation game first. Before completing the games, participants completed measures of familiarity regarding their interaction partners, individualism-collectivism (Singelis, et al., 1995), and social value orientation (Messick & McClintock, 1968; Van

Lange, Otten, De Bruin, & Joireman, 1997). Familiarity with their interaction partners and social value orientation did not impact any of the dependent variables and will not be discussed further.

Once participants had been placed in their assigned groups, they completed a team building exercise to allow them to get to know one another so they would have some basis for making judgments later during the study. The team building exercise took the form of a survival scenario in which the group had to reach consensus regarding what materials would best allow them to survive a plane crash in sub-zero weather (see Appendix G). After completing the team building exercise, participants completed the games as described above, either the resource allocation game or the public goods game first.

Before each round began, participants were asked to indicate the number of points they expected they would contribute or harvest and the number of points they expected each of their fellow group members would either contribute or harvest, depending on which task they were completing. At three time points during the study participants completed the measures of trust, once after the team building exercise but before completing the first game, once after completing the first game but before the second game, and once after both games were complete. Finally, once the group finished all tasks, they completed the measures of non-game group outcomes. See Figure 3 for a timeline of the study.

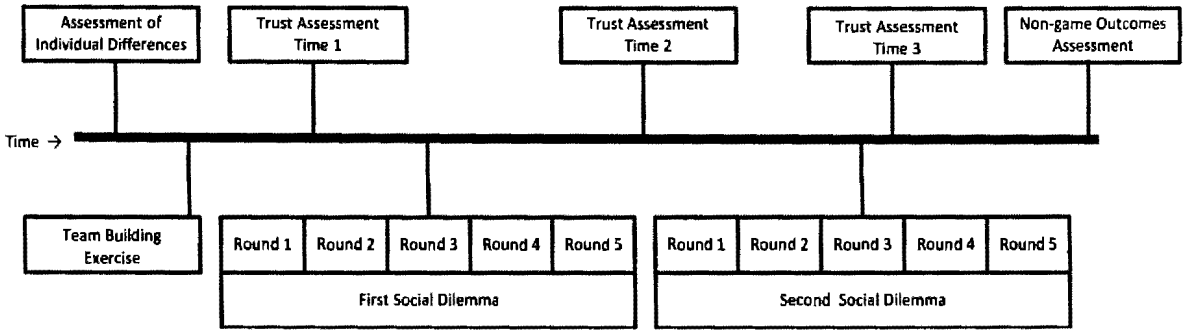

Figure 3. Timeline of the measures assessed and procedure used in the study.

Data Analysis

Unless otherwise specified, data were analyzed using the SoReMo software package available online at <http://davidakenny.net/srm/srmp.htm>. Raw data was entered into text files which were then read into SoReMo. To test the relationships between collectivism and SRM effects and to test the statistical significance of SRM variance components, all data were entered into a single text file and analyzed together. To test the relationships between SRM variance components and outcomes, each group was analyzed separately and the resulting variance components were entered into another data analysis software package (SPSS v11.0) to conduct the regression analyses.

RESULTS

Order Effects

Order of the two social dilemma games was counterbalanced within the study. This was done to check for any possible effects of experience with completing the tasks with the same group. To test whether order influenced cooperative or competitive behavior, the number of bonuses the group received was entered into a 2 (Order; public goods first vs. resource allocation first) x 2 (Game; public goods vs. resource allocation) x 2 (Collectivism; high vs. low groups) ANOVA with Game as a repeated measures factor. The analysis revealed no main effects of either Order, $F(1,33) = 0.01, p = .91$, Collectivism, $F(1,33) = 0.15, p = .71$, or Game, $F(1,35) = 0.09, p = .76$. The interaction effect between Order and Game was not significant, $F(1,35) = 3.24, p = .08$, nor were any other interaction effects, F's < 1.11. Thus, order of the games did not significantly impact cooperative behavior as measured by the number of bonuses the group received.

The contributions given during each round of the public goods game and the harvests taken during each round of the resource allocation game were also analyzed for order effects. Contributions during each round of the public goods game were entered into a regression equation as a dependent variable with order–either public goods game first or resource allocation game first–entered as a dummy coded predictor. As with bonuses, order did not predict contributions during any round of the public goods game (see Table 1). Harvests during each round of the resource allocation game were subjected to the same analysis with order as a dummy coded predictor. Order was related to harvests during the first round of the resource allocation game but was not predictive during any other rounds (see Table 1).

Table 1. Order of Games Predicting Contributions and Harvests in the Public Goods and Resource Allocation Games.

Round	Predictors	*F*	B	*t*	*p*
		Public Goods Game			
1		0.51			.48
	Constant		127.74	25.19	< .001
	Order		-5.33	-0.71	.48
2		2.03			.16
	Constant		131.84	21.88	< .001
	Order		-12.66	-1.43	.16
3		0.73			.40
	Constant		127.89	27.72	< .001
	Order		-5.83	-0.86	.40
4		2.46			.13
	Constant		129.26	30.74	< .001
	Order		-9.73	-1.57	.13
5		0.01			.92
	Constant		123.39	19.24	< .001
	Order		0.91	0.10	.92
		Resource Allocation Game			
1		**6.59**			**.02**
	Constant		**90.38**	**15.50**	**< .001**
	Order		**-22.08**	**-2.57**	**.02**
2		79.23			.13
	Constant		79.23	16.70	< .001
	Order		-10.84	-1.55	.13

Table 1. (continued)

Round	Predictors	*F*	B	*t*	*p*
3		0.47			.50
	Constant		79.75	14.65	< .001
	Order		-5.52	-0.69	.50
4		0.24			.63
	Constant		81.21	16.72	< .001
	Order		-3.51	-0.49	.63
5		0.33			.57
	Constant		68.33	13.68	< .001
	Order		4.05	0.57	.57

Note: **Bold** indicates significant effect, $p < .05$. Data coded such that 0 = Resource Allocation First and 1 = Public Goods First, $N = 37$

Groups that completed the resource allocation game first tended to harvest more points during the first round of the resource allocation game than groups that completed the resource allocation game second. However, this was the only effect of order for either game for any of the rounds so little consideration will be given to this unstable order effect and the effect of order will not be discussed further.

Horizontal & Vertical Individualism-Collectivism

Horizontal and vertical individualism-collectivism were assessed during both the screening session and the laboratory session. The measures taken during the laboratory session served as a manipulation check that individuals in the high collectivism condition were higher in collectivism than individuals in the low collectivism condition. The items on all four scales showed reasonable internal consistency as measured by Cronbach's alpha when measured during the laboratory session; horizontal individualism $\alpha = .72$, vertical

individualism $\alpha = .83$, horizontal collectivism $\alpha = .81$, vertical collectivism $\alpha = .70$. Responses to the items on each scale were averaged to create composite scores. See Table 2 for means and intercorrelations of each scale.

Table 2. Means, Standard Deviations, and Intercorrelations for Individualism-Collectivism Measures.

	Scale	Mean	SD	1	2	3	4
1	Horizontal Individualism	5.30	0.72	.72			
2	Vertical Individualism	4.19	1.01	**.22**	.83		
3	Horizontal Collectivism	5.52	0.75	.04	-.15	.81	
4	Vertical Collectivism	4.57	0.80	.01	**-.30**	**.45**	.70

Note: **Bold** indicates significance, $p < .01$. Values on the diagonal are Cronbach's α reliability coefficients. $N = 148$.

Participants in the high collectivism condition demonstrated greater levels of horizontal collectivism, $M = 5.74$, $SD = 0.63$ vs. $M = 5.19$, $SD = 0.86$, $t(149) = 4.55$, $p < .001$, and vertical collectivism, $M = 4.97$, $SD = 0.69$ vs. $M = 4.06$, $SD = 0.70$, $t(150) = 8.04$, $p < .001$, than individuals in the low collectivism condition. Thus, the screening procedure was successful at creating groups that tended to differ in collectivism.

No differences were observed in the high and low collectivism conditions on the measures of horizontal individualism during the laboratory assessment, $M = 5.30$, $SD = 0.69$ vs. $M = 5.30$, $SD = 0.75$, $t(146) = 0.03$, $p = .97$, which fits well with the notion that individualism and collectivism are independent constructs (Singelis, et al., 1995). A difference was found between the high and low collectivism condition on vertical individualism during the laboratory assessment, $M = 4.00$, $SD = 1.04$ vs. $M = 4.39$, $SD =$

0.94, $t(146) = -2.42$, $p < .05$ indicating that group members in the low collectivism condition tended to be higher in vertical individualism.

Collectivism related to outcomes. To test Hypothesis 1a, high and low collectivism conditions were compared regarding the mean number of bonuses received on both tasks, the number of points contributed during the public goods game, and the number of points harvested during the resource allocation game. Results indicate that groups in the high collectivism condition received a similar number of bonuses during the public goods game, $M = 2.95$, $SD = 1.35$, compared to groups in the low collectivism condition, $M = 3.17$, $SD = 1.89$, $t(35) = -0.41$, $p = .69$. Similarly for the resource allocation game, the high and low collectivism groups did not differ in the number of bonuses, $M = 3.42$, $SD = 1.61$ vs. $M = 2.83$, $SD = 1.98$, respectively, $t(35) = 0.99$, $p = .33$.

In further test of Hypothesis 1a, the number of points the group contributed as a whole during each round of the public goods game and the number of points the group harvested as a whole during each round of the resource allocation game were compared across conditions using between-subjects *t*-tests. Groups in the high collectivism condition tended to contribute a similar number of points compared to groups in the low collectivism condition in the public goods game and tended to harvest similar numbers of points compared to groups in the low collectivism condition in the resource allocation game (see Table 3). Thus, collectivism condition is unrelated to the main task measures. This finding does not support Hypothesis 1a which suggested group members high in collectivism would contribute more points in the public goods game and would harvest fewer points in the resource allocation game. Finding no differences on the outcome measures presents a problem for further mediation analyses. For a successful test of mediation to occur, a

significant relationship between the predictor and the outcome variable must first be demonstrated (Baron & Kenny, 1986). Table 3 shows that at no point during the study were the two collectivism conditions different on the outcome variables of contributions and harvests. Thus, the planned mediation analyses for these constructs were not conducted.

Table 3. Means and Standard Deviations of Contributions and Harvests by Collectivism Condition and Round of Both Social Dilemmas.

Round	High Collectivism	Low Collectivism	*t*	*df*	*p*
		Public Goods Game			
1	127.29 (20.49)	123.18 (24.91)	0.55	35	.59
2	127.87 (22.32)	124.07 (32.34)	0.42	35	.68
3	125.87 (22.38)	124.51 (19.06)	0.20	35	.84
4	123.32 (14.84)	126.35 (23.26)	-0.48	35	.64
5	131.82 (19.55)	115.35 (33.79)	1.83	35	.08
		Resource Allocation Game			
1	77.08 (26.36)	83.56 (30.07)	-0.70	35	.49
2	71.58 (20.90)	77.06 (22.63)	-0.77	35	.45
3	71.58 (16.14)	83.17 (29.79)	-1.48	35	.15
4	79.55 (21.82)	79.65 (21.77)	-0.01	35	.99
5	65.62 (9.81)	75.72 (26.40)	-1.47	35	.15

Note: **Bold** indicates significant effect, $p < .05$. N = 37

Trust

Trust was expected to be vitally important for responses to the two games. Using measures of trust presented in Mayer and Davis (1999), we sought to initially establish whether our data fit the model of trust by Mayer, Davis, and Schoorman (1995) as expected. The model predicts that trustworthiness–whether or not the truster finds the trustee deserving of trust–is a function of the truster's perception of the trustee's ability,

benevolence, and integrity. Means and standard deviations for both self perceptions and other perceptions as well as intercorrelations and reliabilities of the scales can be found in Table 4.

Reliability coefficients presented in Table 4 were calculated by computing Cronbach's α for each group member separately (e.g. calculating α for perceptions of benevolence associated with Group Member #1 and then calculating a separate α for perceptions of benevolence associated with Group Member #2), deleting self-perceptions. The four α's were then averaged. Feldt and Charter (2006) demonstrate that when multiple reliability coefficients are calculated for the same scale, a simple average of the coefficients provides a reasonable measure of the true reliability of the scale that is not substantially different from other, more complex methods of combining reliability coefficients (e.g. transforming to Fischer's *z*, averaging, and transforming back to a reliability coefficient).

Table 4 also presents correlations between the different trust scales. Correlations are calculated by averaging each participant's other perceptions for the four trust perception measures (see SRM Effects Synthesizing Into Meaningful Variance Components, pgs. 65 – 68 of this manuscript for evidence that other perceptions of trust within a single participant are related to one another and suitable for combination). These averages were then correlated. For example, the correlation between ability and benevolence represents the correlation between the participants' average perception that their interaction partners have the ability to act in a trust worthy member with the participants' average perception that their interaction partners will act benevolently.

Individual ratings of trustworthiness were subjected to a regression equation with the participant's ratings of the person's ability, benevolence, and integrity serving as

predictors. This analysis was conducted for the ratings of each group member separately. Thus, we are examining whether ratings of Group Member #1's ability, integrity, and benevolence are predictive of ratings of Group Member #1's trustworthiness and then repeating the analysis for all four group members.

Table 4. Means, Standard Deviations, and Intercorrelations for Trust Measures.

	Scale	Self Perception	Other Perception	1	2	3	4
			Time 1				
1	Ability	3.57 (0.52)	3.64 (0.43)	.82			
2	Benevolence	3.59 (0.50)	2.87 (0.58)	**.28**	.81		
3	Integrity	3.88 (0.43)	3.31 (0.37)	**.59**	**.56**	.79	
4	Trustworthiness	3.44 (0.47)	2.80 (0.50)	**.22**	**.47**	**.43**	.50
			Time 2				
1	Ability	3.81 (0.68)	3.64 (0.55)	.91			
2	Benevolence	3.77 (0.58)	2.98 (0.64)	**.48**	.90		
3	Integrity	3.82 (0.48)	3.31 (0.43)	**.62**	**.63**	.81	
4	Trustworthiness	3.55 (0.54)	2.91 (0.43)	**.24**	**.44**	**.40**	.54
			Time 3				
1	Ability	4.00 (0.66)	3.76 (0.54)	.91			
2	Benevolence	3.92 (0.43)	3.06 (0.74)	**.56**	.93		
3	Integrity	3.91 (0.47)	3.32 (0.52)	**.67**	**.76**	.85	
4	Trustworthiness	3.50 (0.62)	2.88 (0.48)	**.39**	**.51**	**.51**	.55

Note: **Bold** indicates significant correlation, $p < .01$, Values on the diagonal are average Cronbach's α reliability coefficients. $N = 148$ for correlations, $N = 111$ for reliability coefficients.

The data support the model to some extent but not entirely. Taken together, the data form a cohesive pattern. Perceptions of benevolence and integrity are generally shown to be significant predictors of trustworthiness, however, ability is generally not (see Table 5).

Table 5. Ability, Benevolence, and Integrity Predicting Trustworthiness for Each Group Member and Assessment.

Group Member	Predictors	*F*	B	*t*	*p*
	Time 1				
#1		**17.27**			**< .001**
	Group Member #1 Ability		-.05	-0.66	.51
	Group Member #1 Benevolence		.11	1.32	.19
	Group Member #1 Integrity		**.47**	**5.35**	**< .001**
#2		**17.85**			**< .001**
	Group Member #2 Ability		-.02	-0.32	.75
	Group Member #2 Benevolence		**.28**	**3.14**	**.002**
	Group Member #2 Integrity		**.31**	**3.42**	**.001**
#3		**33.19**			**< .001**
	Group Member #3 Ability		-.04	-0.57	.57
	Group Member #3 Benevolence		**.32**	**3.84**	**< .001**
	Group Member #3 Integrity		**.39**	**4.44**	**< .001**
#4		**32.23**			**<.001**
	Group Member #4 Ability		-.03	-0.46	.65
	Group Member #4 Benevolence		**.35**	**4.50**	**< .001**
	Group Member #4 Integrity		**.38**	**4.54**	**< .001**
	Time 2				
#1		**38.11**			**< .001**
	Group Member #1 Ability		.04	0.40	.69
	Group Member #1 Benevolence		**.29**	**3.52**	**.001**
	Group Member #1 Integrity		**.43**	**5.15**	**< .001**

Table 5. (continued)

Group Member	Predictors	*F*	B	*t*	*p*
#2		**31.10**			**< .001**
	Group Member #2 Ability		**-.20**	**-2.46**	**.02**
	Group Member #2 Benevolence		.10	1.06	.29
	Group Member #2 Integrity		**.65**	**6.39**	**< .001**
#3		**35.47**			**< .001**
	Group Member #3 Ability		.03	0.43	.67
	Group Member #3 Benevolence		**.25**	**3.03**	**.003**
	Group Member #3 Integrity		**.44**	**4.70**	**< .001**
#4		**39.45**			**< .001**
	Group Member #4 Ability		.04	0.54	.59
	Group Member #4 Benevolence		**.24**	**2.66**	**.009**
	Group Member #4 Integrity		**.46**	**4.72**	**< .001**
	Time 3				
#1		**31.99**			**< .001**
	Group Member #1 Ability		.09	1.07	.29
	Group Member #1 Benevolence		.14	1.37	.17
	Group Member #1 Integrity		**.46**	**4.46**	**< .001**
#2		**32.47**			**< .001**
	Group Member #2 Ability		-.10	-1.10	.27
	Group Member #2 Benevolence		.21	1.84	.07
	Group Member #2 Integrity		**.52**	**4.17**	**< .001**
#3		**45.25**			**< .001**
	Group Member #3 Ability		-.13	-1.65	.10
	Group Member #3 Benevolence		**.21**	**2.29**	**.02**
	Group Member #3 Integrity		**.60**	**5.73**	**< .001**
#4		**32.24**			**< .001**
	Group Member #4 Ability		-.04	-0.59	.56
	Group Member #4 Benevolence		.07	0.64	.52
	Group Member #4 Integrity		**.59**	**5.34**	**< .001**

Note: **Bold** indicates a significant effect, $p < .05$. All $N = 148$.

Ability may not have been a significant predictor for a number of reasons. Perhaps it was because perceptions of ability were assessed before the participants completed the task. Without having completed the task, participants may not have been able to base their assessments of ability on anything relevant to trustworthiness. The fact that ability continues to generally be an insignificant predictor after three assessments with a game played between each assessment speaks against this interpretation. More likely, participants were not able to gage ability within the games when the only information they received was the number of points each group member chose to contribute or harvest.

Collectivism's Influence on SRM Effects in Expectations

Horizontal and vertical collectivism were expected to relate to SRM effects associated with expectations. Table 6 shows the means of expectations for self and others in the public goods and resource allocation games.

Table 6. Means and Standard Deviations for Expectations of Self and Other Contribution and Harvesting Behavior in Both Games.

Round	Self-Expectation	Other Expectations
	Public Goods	
1	30.97 (14.51)	28.60 (12.42)
2	31.11 (8.67)	30.73 (9.57)
3	30.24 (9.73)	30.25 (9.91)
4	31.37 (8.32)	30.68 (8.86)
5	30.41 (10.12)	29.97 (9.53)
	Resource Allocation	
1	23.49 (13.34)	23.67 (13.23)
2	21.14 (9.67)	20.88 (10.68)
3	20.99 (10.55)	21.07 (10.74)
4	19.71 (8.92)	20.05 (10.12)
5	18.30 (8.89)	18.65 (9.18)

Public goods game expectations. The relationship between the horizontal and vertical individualism-collectivism and SRM effects was assessed with correlations. Recall from Hypothesis 1b, it was expected that collectivism would be related to the tendency to rate all other group members similarly. This tendency would be demonstrated in the data by a positive correlation between collectivism and actor effects–the tendency for individuals to expect that all their interaction partners would respond similarly. SRM effects were calculated for each round of the game using the expectations of contributions during that round. A partial correlation was calculated between each participant's horizontal and vertical collectivism scores and SRM effects, removing the effect of group. Recall that effects within SRM are individual level indices generated from the dyadic measure. Significance is determined by testing the partial correlation at this step. Degrees of freedom for this test are the total number of participants minus the number of groups minus one. Partial correlations are then disattenuated, correcting for measurement error, to arrive at the final correlation values presented in Tables 7 and 8 (Kenny, Kashy, & Cook, 2006).

Results indicate that horizontal collectivism is related to the actor effect in the first round of the public goods game, $r(104) = .27$, but was not related in subsequent rounds (see Table 7, note that two groups were dropped from this analysis). This means that participants higher in horizontal collectivism were more likely to rate their interaction partners as similar than participants lower in horizontal collectivism but only during the first round of the game. Once the participants received feedback regarding their interaction partners, the relationship between collectivism and actor effects is not longer significant. Vertical collectivism was not related to actor effects in the public goods game during any round.

Partner effects were also mostly uncorrelated with measures of collectivism. In the public goods game, partner effects were not correlated with horizontal collectivism during any of the rounds. The lack of correlation between collectivism measures and partner effects is most likely due to there being very little variance in partner effects across any of the expectations data, as will be shown later. Collectivism is not related to the consistency with which an individual is rated at any point during the public goods game.

Table 7. Partial Correlations of Collectivism with SRM Effects Controlling for the Effect of Group in the Public Goods Game.

Actor Effects by Round					
	Round 1	Round 2	Round 3	Round 4	Round 5
Horizontal Collectivism	**.27**	.10	.04	-.08	.10
Vertical Collectivism	-.07	.19	-.04	-.08	.15
Partner Effects by Round					
	Round 1	Round 2	Round 3	Round 4	Round 5
Horizontal Collectivism	.33	.30	.44	-	.18
Vertical Collectivism	-.05	.22	.08	.53	.00

Note: **Bold** indicates a significant correlation, $p < .05$. $N = 140$. Significance tests are based on raw partial correlations. Values in the table are disattenuated correlations correcting for measurement error.

Resource allocation game expectations. The same analysis of the relationship between horizontal and vertical collectivism and actor and partner effects was conducted for expectations during the resource allocation game. Recall that it was expected that collectivism would be related to actor effects in this game as well (Hypothesis 1b). Horizontal collectivism was not related to the actor effect in the resource allocation game during any round (see Table 8). Vertical collectivism was related to actor effects only

during Round 2 of the resource allocation game only. Given that the correlation between actor effects and vertical collectivism in Round 2 is not replicated during any of the other rounds and that we do not have theory to support this unique finding, the validity of this relationship is suspect.

Horizontal collectivism was significantly negatively correlated with partner effects during Round 2 and vertical collectivism was significantly negatively associated with partner effects during Round 1 (see Table 8).

Table 8. Correlations of Collectivism with SRM Effects in the Resource Allocation Game.

Actor Effects by Round					
	Round 1	Round 2	Round 3	Round 4	Round 5
Horizontal Collectivism	-.10	.01	.04	.02	.02
Vertical Collectivism	.02	**-.23**	.18	.04	-.02
Partner Effects by Round					
	Round 1	Round 2	Round 3	Round 4	Round 5
Horizontal Collectivism	-.51	**-.38**	-.09	-.08	-.10
Vertical Collectivism	**-.59**	-.17	-.14	-.11	-.01

Note: Values in **bold** indicate significant, $p < .05$. $N = 144$. Significance tests are based on raw partial correlations. Values in the table are disattenuated correlations correcting for measurement error.

This indicates that those lower in horizontal and vertical collectivism were more likely to be rated consistently during Round 2 of the resource allocation game. This could indicate that participants lower in collectivism were more accurate with regard to their expectations of their interaction partner's behavior. It could also indicate that those higher in collectivism relied on an internal, default perception when determining what they

expected their interaction partners' behavior to be rather than using cues about that person. This is an interesting finding, but it was not among the predictions set forth and will require future research.

Self Ratings and SRM Effects

Public goods game self ratings. Prior to establishing the participant's expectations for the other members of the group, participants answered how much they expected they would contribute to the public good in the following round. Self ratings were correlated with actor effects to establish what is referred to as assumed similarity (Kenny, et al., 2006). That is, the belief that everyone else will contribute the same amount as the person will contribute. Assumed similarity correlations were significant across all rounds, $r(104)$'s = .57, .64, .72, .39, and .69 for Rounds 1-5 respectively. In general, participants believed that their interaction partners would contribute a similar number of points as the participant.

Self ratings can also be correlated with partner effects to determine whether or not the participant's expectations for themselves match the expectations the other group members have regarding that person. This correlation is termed self-other agreement. Correlations in this case are numerically substantial but not significant. This is most likely due to the restricted range and limited variability within the partner effects for the expectation measures, $r(104)$'s = .33, .40, .47, .68, and .06 for Rounds 1-5, respectively. This indicates very little self-other agreement within the data.

The final analysis involving self ratings tested whether a participant's self rating for how much she or he would contribute during a round was related to her or his actual contribution during that round. This analysis was conducted to better understand the

relationship between expectations and behavior within the group. Self ratings were significantly correlated with actual contributions during all five rounds of the public goods game (see Table 9). However, the correlations are not as substantial as one may expect given that the assessment of expectations occurred minutes before the actual behavior. This indicates that, while self ratings relate to actual behavior, there is some tendency to adjust behavior between the assessment of self-ratings and actual behavior.

Table 9. Mean Differences and Correlations Between Self Expectations and Behavior in terms of Contributions in the Public Goods Game.

Behavior	Mean Difference	*SD*	*t*	S.E. Round 1	S. E. Round 2	S. E. Round 3	S. E. Round 4	S. E. Round 5
Round 1	0.41	14.93	0.33	**.35**	**.31**	.11	-.03	.11
Round 2	0.80	9.88	0.98	.09	**.41**	**.51**	.16	**.33**
Round 3	1.37	11.23	1.48	**-.16**	**-.17**	**.31**	**.24**	**.29**
Round 4	-0.03	9.66	-0.04	.03	.02	**.38**	**.40**	**.29**
Round 5	0.72	8.49	1.03	**.17**	.05	**.34**	.13	**.64**

Note: **Bold** indicates significance, $p < .05$. Difference = Contribution Behavior – Self-Expectation of Contribution . S.E. = Self-expectation. $N = 148$.

The potential differences between self expectations and actual behavior raise interesting additional questions. If self-expectations and behavior diff, how and why do the differences occur? Do participants believe they will be more generous when making their expectations judgments than they decide to be when actually making their contribution? Or do participants believe they will be more competitive when assessing their expectations and change their actual behavior to be more group oriented? To answer these questions, the number of points the participant expected to contribute was subtracted from the number of points the participant actually contributed. The difference scores were not different from

zero, but the means tended to be positive numbers. This indicates a slight tendency for actual contributions to be larger than expected contributions.

Resource allocation game self ratings. Participants were also asked how many resources they expected they would harvest for themselves during the next round of the resource allocation game. These measures were correlated with actor and partner effects to establish assumed similarity and self-other agreement. Significant correlations between self measures and actor effects–representing assumed similarity–occurred during all rounds of the resource allocation task, $r(107)$'s = .83, .63, .72, .43, and .59 for the five rounds. As with the public goods game, participants generally expected their interaction partners to harvest a similar number of points as they expected they would harvest themselves.

Correlations between the self measures and partner effects were also calculated to see if the participant and the rest of the group agreed on how many points the participant would harvest from the pool during that round. Similar to the results in the public goods game, some of the correlations were numerically substantial but none of the correlations representing self-other agreement achieved significance, $r(107)$'s = -.02, .06, .29, .46, and -.05 for Rounds 1-5, respectively. Again, the rest of the group had very little agreement with the participant regarding how many points that participant would harvest.

As with the public goods game, self ratings of harvests during each round were correlated with actual harvests during that same round (see Table 10). The correlations in this case were again significant but not as extensive as might be expected given the limited time between self ratings and actual behavior. Expectations in both games are related to actual behavior but there is room for adjustment between assessment of expectations and actual behavior.

The difference score between actual harvest and self expectations was also calculated for harvests during each round. The difference between self-expectations and harvests was negative and significantly different from zero during Rounds 1, 2, and 5. The negative sign indicates that actual harvests were smaller than expectations for harvests, again indicating that participants were more cooperative when asked directly for harvests than when assessing expectations.

Table 10. Mean Differences and Correlations Between Self Expectation of Harvest and Harvesting Behavior in the Resource Allocation Game.

Behavior	Mean Difference	*SD*	*t*	S.E. Round 1	S. E. Round 2	S. E. Round 3	S. E. Round 4	S. E. Round 5
Round 1	**-3.47**	**12.42**	**-3.40**	**.53**	**.39**	**.36**	.16	.06
Round 2	**-2.48**	**9.04**	**-3.33**	**.23**	**.52**	**.48**	**.26**	**.16**
Round 3	-1.69	10.68	-1.93	.12	**.23**	**.43**	**.17**	**.33**
Round 4	0.11	10.95	0.12	.14	**.22**	.04	**.32**	**.20**
Round 5	**-4.11**	**17.74**	**-2.82**	.01	.06	.01	.02	**.63**

Note: **Bold** indicates significance, $p < .05$. Difference = Harvesting Behavior – Self-Expectation of Harvest. S.E. = Self-expectation. $N = 148$.

Collectivism's Influence on SRM Effects in Trust Perceptions

Much like in our analysis of the effects of expectations, the correlation between collectivism and the SRM effects associated with trust perceptions was the first step in this analysis. It was expected that the relationship between collectivism and the SRM effects would be strongest during the first assessment and then diminish as the group members were able to accumulate more behavioral evidence regarding each of their group members.

Ability to act trustworthy. Ability refers to the perception that a group member is able to complete the task and will use that ability to aid the rest of the group. The analysis shows that, for the first assessment, horizontal collectivism was correlated with actor effects, $r(110) = .22$. The correlation between actor effects in ability ratings and horizontal

collectivism then reduces during assessments at Time 2 and Time 3 (see Table 11). The correlation between vertical collectivism and actor effects was similar to the correlations for horizontal collectivism, but not statistically significant, $r(110) = .16$ for the first assessment. This finding indicates that individuals higher in horizontal collectivism had a greater tendency to perceive their group members equally with regard to the ability to act in a trustworthy manner.

Horizontal and vertical collectivism were both uncorrelated with partner effects during all three assessments. Thus, horizontal and vertical collectivism were unrelated to being rated consistently with regard to perceptions of ability to act in a trustworthy manner (see Table 11).

Table 11. Correlations of Collectivism with SRM Effects in Trust Ability Measures.

Correlation with Actor Effects in Trust Ability			
	Time 1	Time 2	Time 3
Horizontal Collectivism	**.22**	.01	.10
Vertical Collectivism	.16	.08	.09
Correlation with Partner Effects in Trust Ability			
	Time 1	Time 2	Time 3
Horizontal Collectivism	.00	.08	.00
Vertical Collectivism	.00	.04	.00

Note: **Bold** indicates significantly different from 0. $N = 148$

Benevolence. Benevolence within the trust model establishes the extent to which the participant believes that the other group members have the participant's best interests at heart and are willing to go out of their way to help the participant. Paralleling the results

found with ability, horizontal collectivism is significantly related to actor effects in the benevolence ratings at Time 1, $r(110) = .34$. This relationship diminishes during the assessments at Time 2 and Time 3, $r(110)$'s = .23 and .08 (see Table 12). Vertical collectivism is unrelated to actor effects in benevolence ratings during all three assessments of trust, $r(110)$'s = .06, -.12 and -.12.

Collectivism measures were unrelated to partner effects in benevolence ratings for the first two assessments of trust (see Table 12). For the third assessment of trust, however, horizontal collectivism was positively correlated with partner effects, $r(110) = .28$. This indicates that individuals high in horizontal collectivism were rated more consistently by their group members with regard to their benevolence than were individuals lower in horizontal collectivism.

Table 12. Correlations of Collectivism with SRM Effects in Trust Benevolence Measures.

Correlation with Actor Effects in Trust Benevolence			
	Time 1	Time 2	Time 3
Horizontal Collectivism	**.34**	.23	.08
Vertical Collectivism	.06	-.12	-.12
Correlation with Partner Effects in Trust Benevolence			
	Time 1	Time 2	Time 3
Horizontal Collectivism	.00	.12	**.28**
Vertical Collectivism	.00	.01	-.05

Note: **Bold** indicates significantly different from 0. $N = 148$

Integrity. Integrity in trust perceptions represents the extent to which the participant is perceived to treat others with fairness and to adhere to values of justice.

Results of the correlations between collectivism and actor and partner effects in integrity ratings mirror those of the other two components of trustworthiness already discussed. As with the other two components, horizontal and vertical collectivism were both positively correlated with actor effects at Time 1, $r(110)$'s = .31 and .26, p's < .05, respectively. These effects diminished during the second and third assessments of trust for both horizontal collectivism, $r(110)$'s = .11 and .00, and vertical collectivism, $r(110)$'s = .10 and -.03, (see Table 13). Thus, as with ability and benevolence, higher horizontal collectivism was related to more consistent ratings of interaction partners with regard to integrity at Time 1. In addition, higher vertical collectivism was also related to consistent ratings across this dimension at Time 1.

Table 13. Correlations of Collectivism with SRM Effects in Trust Integrity Measures.

Correlation with Actor Effects in Trust Integrity			
	Time 1	Time 2	Time 3
Horizontal Collectivism	**.31**	.11	.00
Vertical Collectivism	**.26**	.10	-.03
Correlation with Partner Effects in Trust Integrity			
	Time 1	Time 2	Time 3
Horizontal Collectivism	-.10	.05	**.26**
Vertical Collectivism	-.03	.03	.02

Note: **Bold** indicates significantly different from 0. $N = 148$

Correlations between collectivism and partner effects with regard to integrity ratings also mirror results found with benevolence. As with benevolence, horizontal collectivism was uncorrelated with partner effects during the first two assessment of trust,

$r(110)$'s = -.10 and .05. However, horizontal collectivism was correlated with partner effects during the third and final assessment of trust, $r(110) = .26$. Vertical collectivism was again uncorrelated with partner effects during any assessment, $r(110)$'s = -.03, .03, and .02. This correlation indicates that, during the third assessment of trust, individuals higher in horizontal collectivism were rated more consistently by the other group members than were individuals lower in horizontal collectivism.

Trustworthiness. Mayer, Davis, and Schoorman (1995) conceptualize trustworthiness as the combination of the truster's belief in the trustee's ability, benevolence, and integrity. Thus, one would expect that the correlations between collectivism and SRM effects for trustworthiness would reasonably approximate the results found for those components. Indeed, this is what is found (see Table 14).

Table 14. Correlations of Collectivism with SRM Effects in Trustworthiness Measures.

Correlation with Actor Effects in Trustworthiness			
	Time 1	Time 2	Time 3
Horizontal Collectivism	**.34**	.25	.21
Vertical Collectivism	**.27**	.08	.03
Correlation with Partner Effects in Trustworthiness			
	Time 1	Time 2	Time 3
Horizontal Collectivism	.11	.01	**.30**
Vertical Collectivism	.07	-.10	-.10

Note: **Bold** indicates significantly different from 0. $N = 148$

Horizontal collectivism, $r(110) = .34$, and vertical collectivism, $r(110) = .27$, were both significantly correlated with actor effects at Time 1. The correlations are insignificant

at Time 2 for horizontal collectivism, $r(110) = .25$, and vertical collectivism, $r(110) = .08$ (see Table 14). Correlations continue to be insignificant at Time 3 as well, $r(110) = .21$, for horizontal collectivism and $r(110) = .03$, for vertical collectivism.

Results of correlations between collectivism and partner effects also parallel the correlations found with benevolence and integrity. Partner effects associated with trustworthiness ratings were uncorrelated with horizontal collectivism at Time 1, $r(110) = .11$, and Time 2, $r(110) = .01$, but were positively correlated at Time 3, $r(110) = .30$. Vertical collectivism was uncorrelated with partner effects associated with trustworthiness during all ratings, $r(110)$'s = .07, -.10, and -.10. Thus, those higher in horizontal collectivism were more likely to be rated consistently by the other members of their group during the final assessment of trust than were individuals lower in horizontal collectivism.

Trust propensity. Finally, Hypothesis 1c predicted that high levels of collectivism would result in higher levels of trust propensity, as measured by the scale shown in Appendix C. Recall that trust propensity is treated as an individual difference rather than as a dyadic variable. The trust propensity scale had mean $M = 2.74$, $SD = 0.42$ with Cronbach's $\alpha = .57$. Although the trust propensity measure did not have a strong internal consistency as evidenced by the weak α coefficient, horizontal and vertical collectivism were correlated with measures of trust propensity to test this hypothesis. Neither horizontal ($r = .10, p = .24$) nor vertical collectivism ($r = .10, p = .21$) were correlated with trust propensity. Collectivism was thus not related to a tendency to trust people more by default. Instead, it can only be said that collectivism was related to a tendency to trust others equally.

Self Ratings of Trust and SRM Effects

Measures of trust in the self were collected and correlated with the individual SRM effects. Significant correlations with actor effects would demonstrate that individuals that trust themselves more also tend to trust others more–an index of assumed similarity between themselves and their group members. Significant correlations with partner effects would indicate that individuals rate themselves similarly to how others rate the individual–an index of self-other agreement in trust.

Ability to act trustworthy. Self ratings of ability to act in a trustworthy manner within the task were correlated with the participant's actor and partner effects. The correlations between the individual's self rating and actor effects are shown to be significant for the first, $r(110) = .51$, second, $r(110) = .63$, and third, $r(110) = .59$, assessments of trust, indicating assumed similarity during all three time points. Individuals that rated their own ability to act trustworthy higher tended to rate their interaction partners' ability to act trustworthy higher as well. Correlations between self ratings and partner effects were non-significant for all three assessments of trust, $r(110)$'s = .00, .21, and .00, showing no self-other agreement with regard to ability ratings.

Benevolence. The correlation between the SRM effects and self-ratings of benevolence were very different from the correlations for ability to act trustworthy. Specifically, self ratings of benevolence were uncorrelated with actor effects during all three assessments, $r(110)$'s = -.05, .11, and .20. In the same vein, correlations between self-ratings and partner effects were also unrelated to one another for all three assessments, $r(110)$'s = .00, -.33, -.03, respectively.

Integrity. The pattern of relationships between SRM effects and self-ratings of integrity is different from the patterns of both ratings of ability and benevolence. In this

case, self-ratings of integrity are correlated with actor effects for all three rounds, $r(110)$'s = .25, .51, and .33. Individuals that believed they would act with more integrity also tended to believe that all their interaction partners would act with more integrity. Partner effects and self-ratings were unrelated during the first assessment, $r(110) = .04$. However, during the second and third assessments of trust, self-ratings and partner effects were significantly correlated, $r(110)$'s = .40 and .45, indicating that the participant and the interaction partners agree on the participant's level of integrity.

Trustworthiness. Finally, the pattern of relationships between self-ratings and SRM effects show another pattern for ratings of trustworthiness. For this facet of trust, correlations between actor effects and self-ratings are non-significant for all three assessments, $r(110)$'s = -.14, -.20, and -.11, indicating no assumed similarity. The correlation between partner effects and self-ratings is non-significant during the first assessment of trust, $r(110) = -.31$. However, self-ratings and partner effects were significantly correlated during the final two assessments of trust, $r(110)$'s = .38 and .41. As with integrity, participants and interaction partners tend to agree on how trustworthy the participant tends to be once the interaction partners have evidence upon which to base their assessments.

SRM Effects Synthesizing Into Meaningful Variance Components

The previous analyses were all based on individual difference variables relating to individual level effects generated by the SRM. The following analyses move to the next level of the model which takes the individual level effects and aggregates them into a group-level variance. Variability in the SRM effects within groups is used to establish the SRM variance components.

The numerical value of the components is calculated in two ways. First, what is referred to as absolute variance is the raw numerical calculation of variability within the actor, partner, and relationship effects for that group. Since these numbers can vary widely across groups, the relative variance is generally reported. Relative variance represents the percentage of total variability accounted for by each individual variance component. Thus, reporting that actor variance associated with expectations had a relative variance of 50% indicates that half the variability in expectations is accounted for by actor variability and that the other half is accounted for by partner variability, relationship variability, and error.

These analyses of variance components test the relationships proposed in Hypotheses 2a and 2b. It was expected that groups would display actor variance during the opening rounds of the public goods and resource allocation games but would slowly shift to partner variance as the game progressed.

Public goods game. In the public goods game, there was significant actor variability for Rounds 1-4. This indicates that, in general, groups expected their members would contribute a similar amount of points to the public good. Actor variance accounted for 39.3% of the total variance within the model during Round 1 of the public goods game. The amount of variance in the model accounted for by actor variance during subsequent rounds was 35.2%, 29.0%, and 23.6% during Rounds 2, 3, and 4, respectively. As can be seen in Table 15, actor variance is on a downward trend, as Hypothesis 2a predicted, but does not diminish entirely. Variability within the partner effects was minimal and non-significant for all rounds of the public goods game (see Table 15) suggesting that groups did not achieve consensus on which group members would contribute many resources and which would contribute few. Thus, the prediction that groups would begin the game by

displaying actor variance was supported, however, the prediction that as the game progressed the group would demonstrate partner variance was not supported.

By pooling across all rounds of the public goods game, stable variance can be calculated which allows separation of relationship variance from error. Across the five rounds of the public goods game, 13.2% of the total variability was stable. Separated into each component, actor variance accounted for 5.3%, partner variance 2.1%, and relationship variance 5.8% of the total variance. This pattern indicates that participants tend to believe all their interaction partners will act similarly, but also that unique information within each dyadic pairing is being used to assess the number of points each group member is expected to contribute.

Table 15. Percentage of Variance Accounted for by SRM Components in the Public Goods Game.

	Round 1	Round 2	Round 3	Round 4	Round 5
Actor Variance	**39.3%**	**35.2%**	**29.0%**	**23.6%**	30.8%
Partner Variance	4.2%	6.0%	2.2%	0.2%	1.5%
Relationship Variance + Error	56.5%	58.8%	68.8%	76.2%	67.8%

Note: **Bold** indicates variance significantly different from 0, $p < .05$. $N = 35$ groups

Resource allocation game. For the resource allocation game, significant variance in the SRM effects was found for all rounds. Actor variance was significant across all rounds of the dilemma and partner variance was significant for rounds 2, 3, and 5. For each round respectively, actor variance accounted for most of the total variability (see Table 16). Partner variance for rounds 2, 3, and 5 was also significantly different from zero. These findings indicate that in the resource allocation game–much like in the public goods game–participants generally believed that each of their interaction partners would act

similarly. However, as the resource allocation game progressed, there was some degree of agreement reached across participants regarding what each individual may do during the subsequent round. In this way, Hypothesis 2a was supported for the resource allocation game.

Table 16 Percentage of Variance Accounted for in Expectations by SRM Components in the Resource Allocation Game.

	Round 1	Round 2	Round 3	Round 4	Round 5
Actor Variance	**45.6%**	**44.9%**	**46.8%**	**40.5%**	**35.1%**
Partner Variance	2.8%	**10.0%**	**11.2%**	7.3%	**13.0%**
Relationship Variance + Error	51.5%	45.0%	42.1%	52.2%	51.9%

Note: **Bold** indicates variance significantly different from 0, $p < .05$. $N = 36$

Pooling across all rounds of the resource allocation game, 19.4% of the total variability was stable. Of that variability, 6.6% was accounted for by actor variance, 3.0% by partner variance, and 9.8% accounted for by relationship variance. Much like the public goods game, participants tended to believe all their interaction partners would respond similarly, but there was a tendency to use unique information within each dyadic pairing when assessing the number of points the group members would harvest in the resource allocation game.

Trust measures. Up to this point in our consideration of trust we have established that, in this sample, trust behaves similarly to the conceptualization of Mayer, Davis, and Schoorman (1995) and also that collectivism–in particular horizontal collectivism–is related to dyadic ratings of benevolence, integrity, and trustworthiness. SRM variance components were calculated for each of the four measures of trust to assess the manner in which trust perceptions were distributed across the group.

Ability. With regard to SRM variance components, groups demonstrated significant actor variance and almost no partner variance during all three assessment of ability to act trustworthy. For each of the three assessments, actor variance accounted for 58.4%, 37.1%, and 43.3% of the total variance during the first, second, and third assessments respectively (see Table 17). In contrast, partner variance accounted for 0.0%, 4.0%, and 0.0% of the total variance for rounds 1, 2, and 3, respectively. These findings indicate that group members tended to rate their interaction partners similarly across all rounds, failed to show any consensus regarding which group members had the skills necessary to complete the task in a trustworthy manner, and did not gain this consensus as the tasks progressed.

Table 17. Percentage of Variance Accounted for in Ability to Act Trustworthy by SRM Components.

Component	Time 1	Time 2	Time 3
Actor Variance	**58.4%**	**37.1%**	**43.3%**
Partner Variance	0.0%	1.8%	0.0%
Relationship Variance + Error	41.6%	58.9%	56.7%

Note: **Bold** indicates significantly different from 0. $N = 37$

Benevolence. During the assessment of benevolence at Time 1, significant actor variance was demonstrated with 61.6% of the total variability being represented by the actor component. Partner variance with regard to benevolence was insignificant at this time point, accounting for 0% of the total variability (see Table 18). Thus, ratings of benevolence at Time 1 primarily indicated a tendency for individuals to rate their interaction partners similarly.

Ratings at Time 2 indicate reduced but still significant actor variability with variance on that component accounting for 26.1% of the total variability. Partner variance seemed to increase at this time point, accounting for 12.4% of the total variability, but was still not statistically different from 0. Here, the SRM variances may be showing that the group members are beginning to learn about their interaction partners and are beginning to understand which group members have their best interests at heart and which do not. The reduction in actor variance seems to indicate that individuals are no longer rating their group members similarly but are beginning to understand differences among group members. The fact that partner variance begins to account for some of the total variability seems to confirm this interpretation, however, since the variance is not statistically different from 0 it is difficult to make this firm conclusion without the results from Time 3 continuing the pattern.

Table 18. Percentage of Variance Accounted for in Trust Benevolence by SRM Components.

Component	Time 1	Time 2	Time 3
Actor Variance	**61.6%**	**26.1%**	**39.5%**
Partner Variance	0.0%	12.4%	**21.9%**
Relationship Variance + Error	38.4%	61.5%	38.6%

Note: **Bold** indicates significantly different from 0. $N = 37$

Finally, at Time 3, both actor and partner variance reach significant levels with actor variance accounting for 39.5% of the total variability and partner variance accounting for 21.9% of the variability. These results continue the pattern of increasing partner variance over time and demonstrate that as the group completes additional tasks, individuals are becoming more consistent with their ratings across group members

regarding benevolence. However, this notion is tempered by the fact that actor variance is not diminishing along with the increase in partner variance which indicates at least some participants continue to believe that all group members are equally benevolent.

Integrity. SRM variances associated with ratings of integrity were similar to the findings for benevolence. During the first assessment of trust, only actor effects emerge with 56.0% of the variability begin accounted for by this component. Partner effects account for only 6.4% of the total variability during this assessment and are not significantly different from 0 (see Table 19). Thus, during the first assessment of trust, participants tend to perceive all their interaction partners similarly with regard to integrity.

Table 19. Percentage of Variance Accounted for in Trust Integrity by SRM Components.

Component	Time 1	Time 2	Time 3
Actor Variance	**56.0%**	**16.4%**	**28.9%**
Partner Variance	6.4%	**22.5%**	**26.8%**
Relationship Variance + Error	37.6%	61.1%	44.3%

Note: **Bold** indicates significantly different from 0. $N = 37$

During the second assessment of trust, participants appear to have learned something about their interaction partners as partner variance increases and actor variance is reduced but not eliminated. Actor variance accounts for 16.4% of the total variability at Time 2 and partner variance accounts for 22.5% of the total variability, both significant. This pattern continues during the third assessment in which 28.9% of the total variability is accounted for by actor variance and partner variance accounts for 26.8% of the total variability. Just as with benevolence, these patterns show that participants begin the session believing that each member of their group has similar integrity. After subsequent

iterations of the tasks allow the participants to accumulate behavioral evidence, participants begin to form some consensus regarding which members of the group have more integrity and which have less. However, the continued presence of actor variance still demonstrates that the tendency to rate all interaction partners as similar persists throughout the entire laboratory session.

Trustworthiness. Because trustworthiness is considered to be the combination of a truster's belief of a person's ability, benevolence, and integrity, trustworthiness was expected to generate similar variance components as the three component measures. This is generally true with a few notable exceptions.

During the assessment of trust at Time 1, actor variance is a significant component of ratings of trustworthiness, accounting for 56.9% of all variance. Partner variance is again small and not significantly different from zero, accounting for only 0.9% of the total variability (see Table 20). This matches the results associated with the other components of trust. During the initial phases of interaction, group members tend to rate all of their interaction partners similarly with regard to trustworthiness.

Table 20. Percentage of Variance Accounted for in Trustworthiness by SRM Components.

Component	Time 1	Time 2	Time 3
Actor Variance	**56.9%**	15.6%	**30.1%**
Partner Variance	0.9%	**17.2%**	**17.4%**
Relationship Variance + Error	42.2%	67.3%	52.5%

Note: **Bold** indicates significantly different from 0, $p < .05$. $N = 37$

The second assessment of trustworthiness shows a slight deviation from the results found for the other components in that actor variance is no longer significantly different

from zero. Actor variance does account for 15.6% of the variability, but the result is no longer statistically reliable. Partner variance is significant during the assessment of trustworthiness at Time 2, accounting for 17.2% of the total variability.

Assessment of trustworthiness at Time 3 returns to the pattern seen in ratings of benevolence and integrity. 30.1% of the total variability is accounted for by actor variance and 17.4% is accounted for by partner variance. Both are significantly different from zero. Group members are thus gaining some consensus regarding which members of the group are more or less trustworthy, however the tendency remains to rate all group members similarly.

SRM Variances Associated with Expectations Predicting Contributions and Harvests

Public goods game. Actor and partner variances calculated from participant's expectations of their group members' behavior were entered as predictors into a regression equation with total contributions given by all group members during a single round as the dependent variable. This analysis tests the prediction of Hypothesis 3a in which it was expected that greater partner variance would predict higher levels of contributions. For these analyses, absolute variances were used as they more closely approximated a normal distribution. Two groups were dropped from these analyses, one because their actor variance was an extreme outlier–being twice the size of the next largest actor variance–and another due to technical difficulties that occurred during the session. Separate regression equations were calculated for each round of the game. Results indicate that the variances calculated using SRM significantly predict the total contributions during all rounds of the public goods game except for Rounds 2 and 5 (see Table 21).

Table 21. Regression Tables for Actor and Partner Variance Predicting Group-Level Contributions in the Public Goods Game.

Predictors	*F*	B	*t*	*p*
	Round 1			
	3.67			**.04**
Actor Variance		**-.34**	**-2.11**	**.04**
Partner Variance		.25	1.56	.13
	Round 2			
	0.56			.58
Actor Variance		-.12	-0.67	.51
Partner Variance		-.10	-0.56	.58
	Round 3			
	3.55			**.04**
Actor Variance		-.31	-1.95	.06
Partner Variance		.27	1.66	.11
	Round 4			
	5.23			**.01**
Actor Variance		**-.49**	**-2.91**	**.007**
Partner Variance		-.03	-0.16	.87
	Round 5			
	2.25			.12
Actor Variance		**-.35**	**-2.07**	**.05**
Partner Variance		.16	0.93	.36

Note: **Bold** indicates significance, $p < .05$, $N = 35$

For all rounds in which variances were significant predictors of the total contributions given by group members, actor variance was the best predictor of outcomes significantly predicting contributions except during Round 3 where the effect is marginally significant. The less actor variance a group had during the round, the more points the group as a whole tended to contribute to the public good. Stated another way, belief within

a group that all group members would contribute a similar number of points to the public good combined with divergent views of what the contribution should be was indicative of more competitive behavior.

Resource allocation game. Similar to our analysis with the public goods game, actor and partner variances calculated from the participants' expectations of their group members' harvests were entered as predictors in regression equations with total harvest during each round used as dependent variables. This analysis tests the prediction of Hypothesis 3b in which greater partner variance was expected to relate to smaller harvests. Again, absolute variances were used as predictors instead of relative variances as absolute variances more closely approximated a normal distribution. One group was dropped from this analysis due to missing data on the final round of the dilemma.

Paralleling our findings with the public goods game, the variance components were shown to be significant predictors of the total number of harvests each group made during all five rounds. Again, actor variance was the primary predictor of group level harvests. In this case, the less actor variance a group demonstrated, the more the group tended to harvest during any given round. This finding again parallels the finding in the public goods game in that belief within the group that everyone would harvest a similar number of points combined with different views of what the harvest was expected to be was associated with more competitive behavior (see Table 22).

It is also important to note that partner variance, which was expected to be the driving force behind cooperative behavior, showed almost no ability to predict contributions or harvests. In the public goods game, partner variance's lack of predictive ability may be due to the very low levels of partner variance observed. That is, group

members were unable to agree on which group members would contribute more or less during the game which could contribute to partner variance's lack of predictive power. However, even in the resource allocation game in which groups are able to develop some consensus during rounds 2, 3, and 5, the effects of partner variance are inconsistent.

Table 22. Regression Tables for Actor and Partner Variance Predicting Group-Level Contributions in the Resource Allocation Game.

Predictors	*F*	B	*t*	*p*
	Round 1			
	3.74			**.03**
Actor Variance		**.37**	**2.39**	**.02**
Partner Variance		-.20	-1.32	.20
	Round 2			
	9.98			**< .001**
Actor Variance		**.52**	**3.79**	**.001**
Partner Variance		**-.30**	**-2.23**	**.03**
	Round 3			
	3.80			**.03**
Actor Variance		**.32**	**2.06**	**.05**
Partner Variance		.29	1.85	.07
	Round 4			
	4.80			**< .001**
Actor Variance		**.64**	**4.80**	**< .001**
Partner Variance		.03	0.20	0.84
	Round 5			
	3.33			**.05**
Actor Variance		**.42**	**2.49**	**.02**
Partner Variance		.10	0.57	.57

Note: **Bold** indicates significance, $p < .05$. $N = 36$

During round 2, reduced partner variance is associated with increased harvests as expected. In the next round, the effect is nearly significant but reversed with more partner variance related to larger harvests and during round 5 the effect of partner variance is decidedly non-significant. These results seem to indicate that holding a consensus regarding the number of points group members are expected to contribute or harvest is not predictive of cooperative or competitive behavior within either of the games.

SRM Variances Associated with Trust Predicting Contributions and Harvests

The previous analysis shows that SRM variances associated with expectations can be a significant predictor of contributions and harvests within the games. It was also predicted that SRM variances associated with trust would be equally predictive of behavior. In this endeavor, the variances associated with the different components of trust are not as useful as the variances associated with expectations of contributions or harvests.

Recall that order of the two social dilemmas was counterbalanced across participants. This is important because not all groups received the same dilemma after the assessments of trust at Time 1 and Time 2. Thus, data analysis becomes more difficult as we simply cannot enter the SRM variance components from Time 2 into a regression equation and expect that they would predict outcomes for the public goods game if that task was the first task completed. This is especially true given that changes in the trust variance components across assessments were documented above. Attempts to address this problem followed two strategies. First, the number of bonuses awarded during whichever task the group completed first was used as a proxy for contributions or harvests and was used as the dependent variable. SRM variances generated from trust ratings at Time 1 were then used as predictor variables. These analyses test the predictions in Hypotheses 3c and 3d in

which it was expected that greater partner variance in trust would be associated with more bonuses being received. Results from this analysis can be seen in Table 23.

Table 23. SRM Variance Components Associated with Trust Measures Predicting Number of Bonuses on the First Task Completed.

Trust Measure	Predictors	*F*	B	*t*	*p*
Ability		0.20			.82
	Time 1 Actor Variance		.06	0.37	.71
	Time 1 Partner Variance		.08	0.44	.66
Benevolence		0.37			.69
	Time 1 Actor Variance		-.12	.0.65	.52
	Time 1 Partner Variance		-.06	-0.31	.76
Integrity		0.50			.61
	Time 1 Actor Variance		.17	0.97	.34
	Time 1 Partner Variance		-.06	-0.35	.73
Trustworthiness		0.13			.88
	Time 1 Actor Variance		.06	0.34	.74
	Time 1 Partner Variance		.07	0.39	.70

Note: **Bold** indicates significance, $p < .05$. $N = 37$

Regression equations in which the SRM variances generated from trust ratings at Time 2 were used as predictor variables of the number of bonuses awarded during the second task and are presented in Table 24.

Table 24. SRM Variance Components Associated with Trust Measures Predicting Number of Bonuses on the Second Task Completed.

Trust Measure	Predictors	*F*	B	*T*	*P*
Ability		1.21			.31
	Time 2 Actor Variance		.26	1.53	.13
	Time 2 Partner Variance		-.02	-0.13	.90

Table 24. (continued)

Trust Measure	Predictors	*F*	B	*T*	*P*
Benevolence		0.84			.44
	Time 2 Actor Variance		.22	1.26	.22
	Time 2 Partner Variance		-.11	-0.62	.54
Integrity		0.70			.51
	Time 2 Actor Variance		.19	1.08	.29
	Time 2 Partner Variance		-.12	-0.68	.50
Trustworthiness		**5.98**			**.006**
	Time 2 Actor Variance		**.42**	**2.81**	**.008**
	Time 2 Partner Variance		**.38**	**2.54**	**.02**

Note: **Bold** indicates significance, $p < .05$. $N = 37$

In general these analyses show few effects with regard to group process in trust predicting outcomes. Only one equation is significant, with actor and partner variance associated with ratings of trustworthiness at Time 2 predicting the number of bonuses received during the second game the group completed.

As an additional method of avoiding the order problem, the number of contributions or harvests at the group level was used as the dependent variable and the SRM variances generated during the assessment that immediately preceded that particular task were used as predictor variables. Thus, the SRM variances generated from the assessment of trust that occurred immediately prior to the public goods game were used as predictors of behavior during the public goods game (see Table 25) and the variances generated from the assessment that occurred before the resource allocation game were used as predictors of

behavior during the resource allocation game (see Table 26). The expectation again was that greater partner variance would be associated with larger contributions in the public goods game and smaller harvests in the resource allocation game.

Table 25. Trust Measures Taken Prior to Public Goods Game Predicting Group-Level Contributions in the Public Goods Game.

Round	Predictors	*F*	B	*t*	*p*
	Ability – Pre-Public Goods				
1		0.03			.98
	Actor Variance		-.03	-0.15	.88
	Partner Variance		-.02	-0.13	.90
2		**4.90**			**.01**
	Actor Variance		**-.47**	**-2.97**	**.005**
	Partner Variance		.28	1.77	.09
3		0.74			.49
	Actor Variance		-.10	-0.57	.57
	Partner Variance		.21	1.19	.24
4		1.53			.23
	Actor Variance		-.19	-1.13	.27
	Partner Variance		.27	1.59	.12
5		1.03			.37
	Actor Variance		-.20	-1.18	.25
	Partner Variance		.19	1.11	.27
	Benevolence – Pre-Public Goods				
1		0.13			.88
	Actor Variance		-.06	-0.32	.75
	Partner Variance		.08	0.47	.64

Table 25. (continued)

Round	Predictors	*F*	B	*t*	*p*
2		1.01			.37
	Actor Variance		-.25	-1.41	.17
	Partner Variance		.10	0.57	.57
3		0.15			.86
	Actor Variance		-.09	-0.48	.64
	Partner Variance		.07	0.38	.70
4		0.20			.82
	Actor Variance		.11	0.60	.55
	Partner Variance		-.06	-0.35	.73
5		1.21			.31
	Actor Variance		.22	1.28	.21
	Partner Variance		-.21	-1.21	.23
	Integrity – Pre-Public Goods				
1		0.16			.86
	Actor Variance		.04	0.22	.83
	Partner Variance		.08	0.45	.64
2		0.89			.42
	Actor Variance		.07	0.43	.67
	Partner Variance		.20	1.14	.26
3		1.23			.31
	Actor Variance		.08	0.48	.63
	Partner Variance		.23	1.35	.19

Table 25. (continued)

Round	Predictors	*F*	B	*t*	*p*
4		0.80			.46
	Actor Variance		.01	0.05	.96
	Partner Variance		.21	1.22	.23
5		1.07			.36
	Actor Variance		.25	1.45	.16
	Partner Variance		-.02	-0.13	.90
	Trustworthiness – Pre-Public Goods				
1		0.56			.58
	Actor Variance		-.03	-0.19	.85
	Partner Variance		.17	0.98	.34
2		0.57			.57
	Actor Variance		.08	0.47	.64
	Partner Variance		.18	1.04	.31
3		0.17			.85
	Actor Variance		-.04	-0.25	.80
	Partner Variance		.08	0.45	.66
4		0.74			.49
	Actor Variance		.20	1.13	.27
	Partner Variance		-.03	-0.18	.86
5		2.57			.09
	Actor Variance		**.37**	**2.25**	**.03**
	Partner Variance		.12	0.75	.46

Note: **Bold** indicates significance, $p < .05$, $N = 37$

Table 26. Trust Measures Taken Prior to Resource Allocation Game Predicting Group-Level Contributions in the Resource Allocation Game.

Round	Predictors	*F*	B	*t*	*p*
	Ability – Pre-Resource Allocation				
1		0.88			.42
	Actor Variance		-.16	-0.93	.36
	Partner Variance		.18	1.06	.30
2		1.62			.21
	Actor Variance		-.26	-1.55	.13
	Partner Variance		.19	1.12	.27
3		0.85			.44
	Actor Variance		-.22	-1.31	.20
	Partner Variance		.04	0.23	.82
4		2.41			.11
	Actor Variance		-.31	-1.90	.07
	Partner Variance		.22	1.34	.19
5		3.01			.07
	Actor Variance		**-.40**	**-2.32**	**.03**
	Partner Variance		-.07	-0.41	.68
	Benevolence – Pre-Resource Allocation				
1		1.51			.24
	Actor Variance		.18	1.08	.29
	Partner Variance		-.24	-1.46	.15
2		0.77			.47
	Actor Variance		.11	0.63	.53
	Partner Variance		-.19	-1.12	.27
3		1.57			.22
	Actor Variance		.20	1.24	.23
	Partner Variance		-.23	-1.38	.18

Table 26. (continued)

Round	Predictors	*F*	B	*t*	*p*
4		0.67			.52
	Actor Variance		.19	1.11	.28
	Partner Variance		.04	0.22	.82
5		1.59			.22
	Actor Variance		-.25	-1.42	.17
	Partner Variance		.12	0.75	.46
	Integrity – Pre-Resource Allocation				
1		0.29			.75
	Actor Variance		.02	0.11	.91
	Partner Variance		-.13	-0.75	.46
2		0.12			.89
	Actor Variance		-.01	-0.03	.97
	Partner Variance		-.08	-0.49	.63
3		0.95			.40
	Actor Variance		-.11	-0.64	.53
	Partner Variance		-.20	-1.20	.24
4		1.20			.31
	Actor Variance		-.25	-1.53	.14
	Partner Variance		.05	0.29	.77
5		2.25			.12
	Actor Variance		-.24	-1.41	.17
	Partner Variance		.28	1.63	.11
	Trustworthiness – Pre-Resource Allocation				
1		0.55			.58
	Actor Variance		.17	0.98	.33
	Partner Variance		-.04	-0.26	.80
2		1.50			.24
	Actor Variance		.13	0.79	.43
	Partner Variance		-.24	-1.45	.16

Table 26. (continued)

Round	Predictors	*F*	B	*t*	*p*
3		0.04			.96
	Actor Variance		-.05	-0.28	.78
	Partner Variance		.01	0.07	.95
4		0.95			.40
	Actor Variance		-.21	-1.27	.21
	Partner Variance		-.11	-0.67	.51
5		**5.02**			**.01**
	Actor Variance		.12	0.72	.48
	Partner Variance		**-.49**	**-3.05**	**.005**

Note: **Bold** indicates significance, $p < .05$. $N = 37$

The results in Tables 25 and 26 parallel the results of bonuses received. In general, the SRM variances associated with all the trust measures assessed prior to the public goods game do not predict contributions to the public goods game. SRM variances associated with trust measures assessed prior to the resource allocation game do a generally poor job of predicting harvests as well. The only exceptions are that reduced actor variance associated with ability is related to larger contributions during Round 2 of the public goods game and reduced partner variance associated with trustworthiness is associated with larger harvests in the resource allocation game during round 5. These two effects appear to be isolated incidents that do not reflect the general pattern in the data; an inability of SRM variances associated with trust measures to predict behavior within the games.

Collectivism and SRM Variances Predicting Non-game Outcomes

In addition to the contribution or harvesting behavior of the group, this study included measures of other outcomes of interest. In particular, outcomes of interest

included how group members felt about the interaction and their interaction partners and if they were satisfied with their interaction.

The quality of the team interaction was measured using the Team Diagnostic Survey (TDS). Four different aspects of team interaction were assessed, quality of team interaction, satisfaction with team relationships, general satisfaction, and internal work motivation. As mentioned previously, Wageman, et al. (2005) state that measures obtained by the TDS are only applicable at the group level and only if analysis indicates that group members are more consistent with their ratings of their interaction than are ratings of the entire group–essentially that an intraclass correlation (ICC) for the measure is significantly different from zero. Thus, our first analysis was to calculate intraclass correlations for all measures to ensure that they demonstrate intra-group consistency.

Intraclass correlations for all TDS measures were significant. The measure of quality of team interaction produced an ICC of $\rho^2 = 0.15, p < .05$, satisfaction with team relationships produced an ICC of $\rho^2 = 0.34, p < .05$, general satisfaction produced an ICC of $\rho^2 = 0.27, p < .05$, and internal work motivation generated an ICC of $\rho^2 = 0.21, p < .05$. Thus, all measures show significant intra-group consistency. Because of this, the individual ratings of the four group members were averaged across each group to create a group-level representation of each measure.

Collectivism condition was related to two of the four outcome measures from the Team Diagnostic Survey. Specifically, groups in the high collectivism condition tended to report more satisfaction with team relationships, $M = 4.01$, $SD = 0.30$, than groups in the low collectivism condition, $M = 3.68$, $SD = 0.26$, $t(35) = 3.46$, $p < .001$. Groups in the high collectivism condition also tended to report less internal work motivation among their

groups, $M = 3.61$, $SD = 0.31$, than groups in the low collectivism condition, $M = 3.86$, $SD = 0.37$, $t(35) = 2.20$, $p < .05$.

SRM variances associated with expectations were expected to predict outcomes associated with the TDS. It was predicted that increased partner variance would result in greater group assessment of quality of team interaction, more satisfaction with team relationships, more general satisfaction, and more internal work motivation. Since these outcomes were assessed at the end of the study, after the tasks were complete, it is not practical to use the round by round variances to predict these measures. Instead, the stable variances, calculated using information from all five rounds of each game, were used. Since multiple assessments were used in calculating these variances, the relationship variance can be separated from error variance, allowing the use of that variance along with actor and partner in the prediction of the TDS measures. Thus, the stable actor, partner, and relationship variances were entered into a regression equation predicting group level assessment of the TDS measures.

Public goods expectations. SRM variance components associated with the expectations regarding the public goods game were entered as predictors into regression equations. Four different regression equations were calculated–one for each TDS outcome variable of interest. Stable actor, partner, and relationship variance did not predict ratings of quality of team interaction, $F(3,33) = 0.11$, $p = .96$. In addition, the variances also did not predict satisfaction with team relationships, $F(3,33) = 0.16$, $p = .93$ or general satisfaction, $F(3,33) = 0.06$, $p = .98$. Thus, SRM variances associated with expectations in the public goods game were entirely unrelated to three additional outcome measures.

The results of the regression with the SRM variances predicting internal work motivation fit the same general pattern, but with some interesting trends. As with the other measures, stable actor, partner, and relationship variance did not significantly predict internal work motivation, $F(3,33) = 1.66, p = .20, R^2 = 0.13$. In contrast to the other three measures, one of the predictors in this equation did achieve significance. Partner variance was a significant predictor for internal work motivation, $\beta = 0.35, t = 2.11, p < .05$. On its own, this finding is not remarkably suggestive since the entire equation is not significant. However, as will be seen later, this pattern is consistent with other expectation variances, suggesting that an effect may exist and our study simply did not have enough power to uncover it.

Resource allocation expectations. Stable actor, partner, and relationship variances associated with the expectations in the resource allocation game were also entered as predictors into regression equations predicting the four TDS measures; quality of team interaction, satisfaction with team relationships, general satisfaction, and internal work motivation. The variances did not significantly predict group level ratings on the measure of quality of team interaction, $F(3,33) = 0.54, p = .66$. Variances also did not predict group-level ratings on satisfaction with team relationships, $F(3,33) = 0.27, p = .85$, or general satisfaction, $F(3,33) = 0.03, p = .99$. As with expectations in the public goods game, stable variances associated with expectations in the resource allocation game are unrelated to the two measures of satisfaction or quality of team interaction.

The measure of internal work motivation again presents interesting findings that are somewhat different than the findings from the other three measures. Like the other three, stable variances do not produce statistically significant predictions of internal work

motivation, $F(3,33) = 2.21, p = .10, R^2 = 0.17$. Unlike the other three, partner variance is again a significant predictor within the overall equation, $\beta = 0.37, t = 2.26, p < .05$ in that increased partner variability is associated with increased internal work motivation for the group. In other words, the more group members develop a consensus regarding what each group member will do within the resource allocation game, the more likely the group is to report feeling motivated and uplifted by the task they are performing.

Again, interpreting these effects is difficult given that the overall equation is not significant, however, the fact that this same pattern of results exists within the public goods game would seem to be a good indicator that an effect may exist and the current study was simply not powerful enough to uncover it.

Trust measures. Stable SRM variances associated with the four trust measures were also used to predict the TDS measures. It was expected that variances associated with the trust measures may be better predictors of social outcomes such as quality of team interaction and satisfaction with team relationships than variances associated with expectations. This is because the variances associated with expectations are more associated with accomplishing a task. The measures of trust, on the other hand, represent more interpersonal matters which may better relate to forming and maintaining relationships. Since measures of trust were assessed at three different time points throughout the study, it was possible to calculate stable actor, partner, and relationship variances. All three variances were again used as predictors of the four TDS measures. Hypothesis 3e predicted that increased partner variance in the trust measures would generally result in more satisfaction and internal work motivation.

Ability to act trustworthy. Stable actor, partner, and relationship variance associated with ability were entered as predictors into four separate regression equations predicting quality of team interactions, satisfaction with team relationships, general satisfaction, and internal work motivation. Stable variances were unrelated to all four TDS measures; quality of team interaction, $F(3,33) = 0.09$, $p = .97$, satisfaction with team relationships, $F(3,33) = 1.13$, $p = .35$, general satisfaction, $F(3,33) = 0.29$, $p = .83$, and internal work motivation, $F(3,33) = 0.03$, $p = .99$. Stable variance associated with ability was unrelated to the TDS outcome measures.

Benevolence. Stable actor, partner, and relationship variance associated with benevolence was entered into regression equations predicting the four TDS measures. As with ability, stable variances were unrelated to all four TDS measures; quality of team interaction, $F(3,33) = 0.74$, $p = .54$, satisfaction with team relationships, $F(3,33) = 1.29$, $p = .29$, general satisfaction, $F(3,33) = 0.27$, $p = .84$, and internal work motivation, $F(3,33) = 0.15$, $p = .93$. Once again, none of the stable variances were significant predictors of the satisfaction, quality of interaction, or motivation measures.

Integrity. Variances associated with integrity were subjected to the same analyses as the other two indicators of trust. Similar to the other two indicators, stable variances were unrelated to all four TDS measures; quality of team interaction, $F(3,33) = 0.98$, $p = .41$, satisfaction with team relationships, $F(3,33) = 0.19$, $p = .91$, general satisfaction, $F(3,33) = 0.67$, $p = .57$, and internal work motivation, $F(3,33) = 0.48$, $p = .70$. Thus, stable variances associated with all three preliminary indicators of trustworthiness are unrelated to social outcomes at the group level.

Trustworthiness. Finally, the stable variances associated with trustworthiness were entered into regression equations predicting the four TDS measures. Since trustworthiness is conceptualized as the combination of all three of the previous components, it was expected that none of the variances in trustworthiness would significantly predict the TDS measures either. Indeed, this is what was found. Stable variances were not significant predictors for quality of team interaction, $F(3,33) = 0.24$, $p = .87$, satisfaction with team relationships, $F(3,33) = 2.07$, $p = .12$, general satisfaction, $F(3,33) = 0.89$, $p = .46$, or internal work motivation, $F(3,33) = 1.85$, $p = .16$.

In the two cases where the equations approach statistical significance, one variance component is shown to be a significant predictor. With regard to satisfaction with team relationships, partner variance is shown to be a significant, negative predictor, $t = -2.19$, $p < .05$. This means that groups that achieve greater consensus with regard to which members of the group are more trustworthy and which are less trustworthy may have reduced perceptions of satisfaction with the team relationships. Also, relationship variance is a significant predictor of internal work motivation, $t = 2.27$, $p < .05$. Groups in which their members tend to use unique information about each group member when rating their trustworthiness may have increased internal work motivation. Given that the equations associated with these findings were not significant and that they were not replicated across time points, interpretation of these findings is tentative at best.

Summary

A general summary of the results from this study is shown in Figure 4. In total, the results of this study add to our knowledge of how individual difference variables such as collectivism relate to perceptions of others within a group. Results also demonstrate how

group processes associated with expectations can influence outcomes within social dilemmas. The study demonstrates that collectivism is related to expectations during an initial round of a public goods dilemma, but the relationship disappears quickly as participants gain evidence of how their group members behave. In addition, participants completing the social dilemma games generally expect that all group members will act similarly to how the participant will act and participants gain little consensus regarding which group members are more collectively oriented and which are more individually oriented during the games. Most notably, the present study demonstrates that SRM

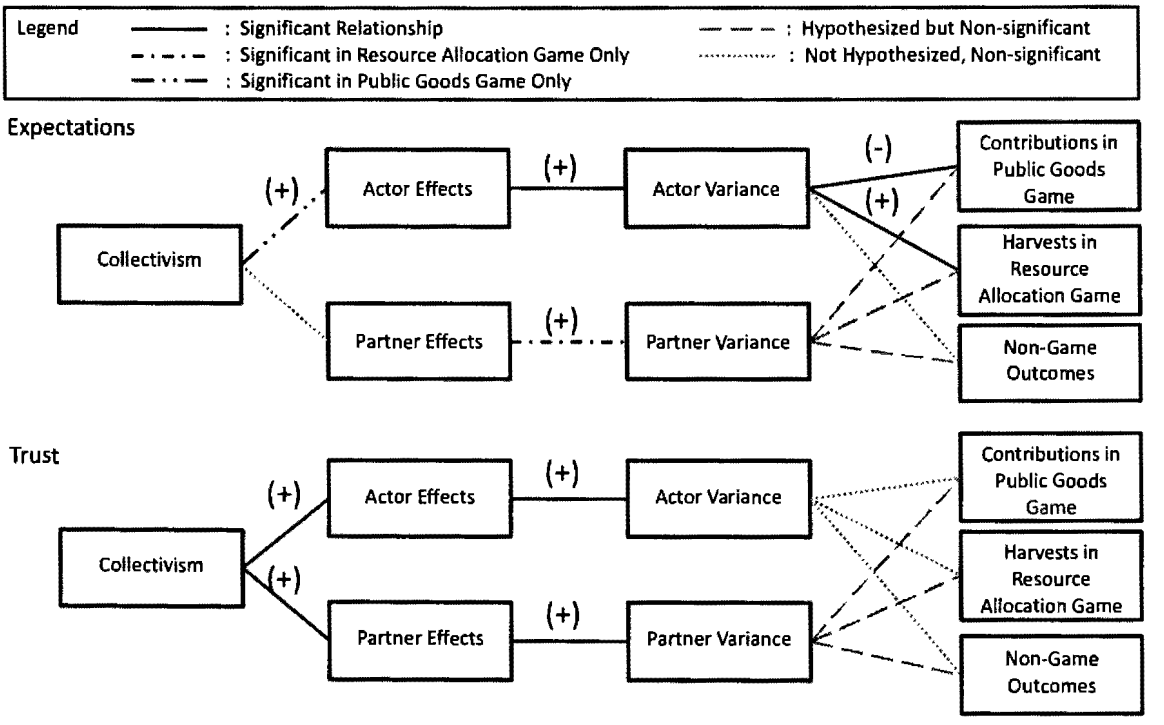

Figure 4. General findings of the study collapsed across time points.

variance components associated with the participant's expectations of their partners' immediate behavior are effective at predicting group level outcomes within social dilemmas.

The study also examines the relationship between collectivism and trust as well as how the variance components associated with trust predict outcomes within the social

dilemma. In general, collectivism has an interesting relationship to trust. Horizontal collectivism is related to a tendency to perceive all group members as equal on all four components of trust during the initial assessment. Those higher in vertical collectivism also rate the other group members as more similar to one another with regard to integrity and trustworthiness. In addition, those higher in horizontal collectivism tend to be rated more consistently by their group members with regard to benevolence, integrity, and trustworthiness. We do find that perceptions of trust show meaningful variance when analyzed using social relations modeling, primarily finding that participant's tend to believe that all group members should be equally trusted during the first assessment. As the group continues to interact with one another, the members begin to gain consensus regarding which group members can be trusted and which cannot. Unfortunately, SRM variances associated with trust do not consistently relate to any outcomes measured in this study.

DISCUSSION

The results of the study present an interesting picture of how differences in collectivism lead to differential perceptions which, when coupled with variability in perceptions across group members, can impact the tendency of groups to engage in cooperative or competitive behavior. Results also demonstrate that variance components associated with measures of trust do not predict group level outcomes in a reliable way.

Collectivism and Expectations

The first construct in our model of group functioning (Figure 2) is distal variables which are not expected to directly impact group process during the games. In this experiment, I chose to examine the impact collectivism has on perceptions in social dilemmas and on cooperative and competitive behavior. Groups high in collectivism were compared to groups low in collectivism with regard to the number of bonuses received, the number of points contributed in the public goods game, and the number of points harvested in the resource allocation game. This analysis showed that groups in the high collectivism condition received just as many bonuses, contributed similar numbers of points in the public goods game, and harvested similar numbers of points in the resource allocation game as groups in the low collectivism condition. Simply knowing that a group was high or low in collectivism did not differentiate cooperative or competitive behavior. This finding is contrary to some speculation regarding how collectivism relates to cooperative behavior in groups (Levi, 2007). These findings are also in contrast to some previous research (Parks & Vu, 1994) but are in line with other previous research (Yamagishi, 1988). This inconsistent pattern of results may have occurred because the current study used co-located groups which interacted before the games were conducted. Studies have

shown that interaction prior to completing the dilemma increases cooperative behaviors (Camerer, 2003).

The most interesting question involving the impact of collectivism is whether collectivism impacts an individual's perceptions of how their fellow group members will behave. One could predict that individuals high in collectivism would perceive all their fellow members as similar because they tend to incorporate their group members into their own sense of self. Alternatively, one could predict that individuals high in collectivism would be more likely to agree with one another regarding their perceptions of their fellow group members due to the high costs associated with bringing in a new group member and the importance placed on harmonious interaction. Results demonstrate that collectivism is related to perceptions of how group members will behave in at least the public goods game. Individuals higher in horizontal collectivism demonstrate an increased tendency to expect that all their interaction partners will behave similarly during the first round of the game. After the first round of the game is complete and group members receive feedback regarding the behavior of their group members this relationship disappears.

Finding collectivism relating to perceptions of group behavior during the first round of the task is important theoretically for a number of reasons; (1) it demonstrates differences in strategic action are likely to occur in groups that differ in collectivism because of different patterns of expected behavior between the two groups, (2) it demonstrates that distal inputs unrelated to a task can be related to more proximal, task-related inputs such as expectations of group behavior, and (3) it demonstrates that, as group members become aware of the proximal inputs, the impact of distal inputs is reduced. Thus, this pattern is consistent with a conceptualization of group functioning that places

proximal inputs closer to group process than distal inputs in terms of relevance to completing the group task (Hinsz & Ladbury, in press) and places cultural variables as important instigators of strategic behavior in groups.

Collectivism and Trust

The relationship between trust and collectivism follows a similar pattern demonstrated in the relationship between expectations and collectivism. It was expected that collectivism would be related to perceptions of trust early in the task but would then diminish as participants accumulated evidence upon which to base their perceptions. As expected, collectivism was correlated with a tendency to perceive all group members similarly with regard to all measures of trust during the first assessment. In particular, horizontal collectivism was shown to be the more effective predictor during the early assessments given its repeated correlations with multiple facets of trust. This relationship disappeared during assessments at Time 2 and 3. This indicates that individuals higher in collectivism will tend to rate their interaction partners as equally deserving of trust when no other evidence is available, but will relinquish those beliefs once they have proximal task inputs on which to base their ratings. It is also important to note that the analysis with trust propensity showed no relationship to collectivism, signifying that individuals high in collectivism and individuals low in collectivism trust others similarly. The effect is driven by high collectivist's perceptions that all group members equally deserve of trust, not that high collectivists perceive their fellow group members as more deserving of trust.

It is somewhat unexpected that horizontal collectivism was shown to consistently relate to actor effects whereas vertical collectivism was related for only two facets of trust. However, these results are not surprising given the context of the task. Recall that

horizontal collectivism focuses on collective group identity and harmony within equal status groups whereas vertical collectivism relates more to groups with established hierarchies and power structures. Group members in this study were all of equal status with no one group member being designated as leader or given more power over outcomes than anyone else. Thus, the context corresponds to the nature of horizontal collectivism allowing the individuals high in that disposition to express the trait within the situation. The necessity of such correspondence between task and culturally-based dispositions has been documented in many other contexts (e.g., Hong et al., 2000; Hong et al., 2003; Ladbury & Hinsz, 2009).

SRM Variance Associated with Expectations

The next set of analyses sought to understand the nature of perceptions and how those perceptions are distributed across group members. The primary questions involved in this analysis were whether or not group members expect that all of their interaction partners will contribute or harvest a similar amount of resources and if group members agree with one another regarding which member will contribute or harvest the most resources.

Analyses of expectation measures using SRM indicate that expectations of group members' behavior in social dilemmas are driven almost entirely by actor variance. That is, group members tend to expect that all their interaction partners will act similarly when confronted with the social dilemma situation. In addition, the large correlations between self ratings and actor effects indicate that group members believe that their interaction partners will all act similar to the way the group member will act. There is very little partner variance associated with measures of expectations particularly in the public goods game, indicating that group members are not arriving at any sort of consensus regarding

which group members contribute more or fewer resources. This is true even after five rounds of the public goods game. Group members do tend to agree to some extent on which group members will harvest more or less resources in the resource allocation game. The amount of agreement is small but statistically significant for three of the five rounds of the game.

The repeated, consistent belief that group members will respond similarly during each round of the game may appear to be a case of belief perseverance (Lepper, Ross, & Lau, 1986). Group members continue to believe that their interaction partners will respond similarly even in the face of contradictory evidence from the situation. Continued actor variance across rounds may be indicative of sustained hope that group members will engage in cooperative actions at some point. Group members may be hoping that all of their interaction partners will see the benefits of cooperation, the consequences of competition, and will act accordingly.

SRM Variances Associated With Trust

Trust perceptions are shown to operate in interesting ways from a social relations perspective. Others have demonstrated that trust perceptions in newly interacting groups are primarily driven by actor variability (Bergman, et al., 2010). Our results replicate this finding during our assessment at Time 1. Groups tended to perceive all group members similarly with regard to the members' ability to act in a manner deserving of trust, benevolence towards the truster, integrity, and trustworthiness when they have interacted minimally with one another in the past.

Extending upon the findings at Time 1, changes in perceptions of trust are shown at Time 2 and 3. Partner variance begins to increase in the assessment of trust ratings that are

made after groups complete one game and further increases after both games. This result indicates that the group is beginning to form a consensus regarding which members can be trusted and which cannot. The consensus begins to form after the group receives behavioral evidence of how each member of the group acts when placed in a situation in which they can act in accordance with the individual's interest or the group's interest. This agreement regarding which group members can be trusted and which cannot seems to build even without an accompanying decrease in actor variance associated with trust perceptions. Thus, group members persist in a belief that all fellow group members are equally deserving of trust, yet begin to shift their perceptions toward a common understanding as they receive more evidence.

Interestingly, actor variance is still significant during the assessment at Time 3, indicating that there still exists a tendency to trust all members of the group equally. Even after two games in which some group members demonstrate their worthiness of the group members' trust and others do not, there still exists the belief that everyone in the group is equally worthy of trust. This may indicate a tendency of individuals to base their perceptions of trust on how much they trust the most trustable group member or, potentially the least trustable group member.

The correlations between self-ratings, actor effects, and partner effects show an interesting pattern in judgments about trust. The correlations between self ratings of benevolence and actor effects and self-ratings of trustworthiness and actor effects are not significant. The implication being that the basis for perceptions of benevolence and trustworthiness in others are not found in how much individuals believe in their own benevolence or trustworthiness. Perceptions of benevolence and trustworthiness in

minimally interacting groups may be driven by the belief that all will respond similarly to one another, but self ratings do not serve as an anchor point. Correlations between self-ratings of ability and actor effects and self-ratings of integrity and actor effects were significant. This pattern of results is consistent with the notion that ability and integrity are more difficult to judge in minimally interacting groups, however, the data do not allow us to confidently make this claim.

Participants are able to attain self-other agreement, indicated by a significant correlation between self-ratings and partner effects, for measures of integrity and trustworthiness, indicating that these measures can be judged in minimally interacting groups. For reasons this study is not equipped to answer, participants seem to be accurate in their self-assessments regarding integrity and trustworthiness and are equipped to make similar judgments about their teammates following a short series of interactions.

Expectation Variance Components Related to Outcomes

The current study examined the efficacy of SRM variability to predict outcomes in the two games. Two primary types of outcomes were selected as important to assessing performance on the task. First, the task-oriented outcomes which included the number of points contributed during the public goods game and harvested during the resource allocation game. Second, the measures associated with the Team Diagnostic Survey such as quality of interaction, satisfaction with relationships, general satisfaction, and internal work motivation. These outcomes were viewed as more socially oriented outcomes and represent how much the group enjoyed working together and whether or not they would enjoy continuing to work together.

Regression analyses indicate that indices associated with expectations are quite good at predicting the task-oriented outcomes. In particular actor variance significantly predicts the number of resources contributed in the public goods game and harvested in the resource allocation game during most rounds of each game. The pattern of results indicates that increased actor variance within the group results in increased competitive behavior among group members. This is true for both types of games and across nearly all rounds. Essentially, the groups that are most competitive are the groups in which all group members believe that everyone will respond similarly but the expectations of what the contribution or harvest will be varies across group members.

The most striking thing about finding that SRM variance components predict behavior in the two games is that actor variance in expectations is shown to be an important factor in competition. If all participants expect each group member will be highly cooperative, the group tends to cooperate within the game with increased contributions or decreased harvests. If all participants expect each group member will be very individualistically oriented, more group cooperation is again the result. When the expectations are variable, that is, one group member expects everyone in the group to be highly cooperative and others in the group expect everyone in the group to be highly individualistic, more competitive behavior at the group level is observed.

Understanding why variability in expectations generates competitive behavior is aided by two additional findings. First, the correlations between self-expectation and actual contributing behavior are significant but smaller than might be expected across the five rounds of both games. The size of the correlations indicates that there is definite similarity between self-expectations and actual behavior, but in the time between when

expectations are assessed and actions are committed participants may be considering the implications of their contribution or harvest. If each group member's self expectation is subtracted from his or her final action, the mean difference is negative during most rounds of the resource allocation game, indicating that harvests are smaller than expectations. This indicates that participants may be willing to attempt a cooperative action in that game even though they fully expect the group to act competitively. If all group members choose to follow that strategy, they may find themselves pleasantly surprised that their entire group appears willing to act in the best interest of the collective.

The pattern of results demonstrates very clearly that variability in the expected level of contributing or harvesting across the entire group engenders competition. When there is variability in the group regarding expectations, some group members have their expectations fulfilled and others have their expectations violated. For example, imagine a group in which one member believes the group will respond entirely cooperatively, another group member expects the group will respond entire competitively, and the two remaining group members fall along a continuum between the two extremes during the public goods game. Further imagine that all group members act during the game in accordance with their expectations. In this case, a situation would arise in which one group member contributes a large number of points to the good, one contributes the minimum number of points and the other two would contribute some points, but below the maximum. Under these conditions, the bonus is unlikely to be provided and players that contribute large numbers of points will find themselves losing points. This pattern of responding may initiate a cycle in which the cooperative player attempts to protect himself/herself from the possibility of being further exploited and reduce contributions. The competitive player

would find his or her expectations fulfilled and would be rewarded for contributing little to the public good. The two players in between would be forced to choose between contributing more points, gaining the possibility of receiving more group bonuses but risking being exploited, or contributing fewer points, receiving fewer group bonuses but protecting themselves from exploitation. Given that placing oneself at risk is highly irrational, it is very unlikely that the former scenario would occur (Komorita & Parks, 1996) unless a system exists to punish free-riders (Yamagishi, 1986).

Interestingly, variance components associated with expectations do not significantly predict the measures of quality of team interaction, satisfaction with team relationships, general satisfaction, or internal work motivation associated with the TDS. This may indicate that proximal inputs related to completing the task tend not to impact the more social aspects of the group situation. We do find that our distal input, collectivism, is related to two of the four measures, namely satisfaction with team relationships and internal work motivation such that high collectivism groups report more satisfaction with team relationships and low collectivism groups report more internal work motivation. This may suggest that groups high in collectivism will find more satisfaction in their relationships regardless of what happens within the task. Similarly, groups low in collectivism may simply be more internally motivated regardless of the outcomes.

Trust Variance Components Related to Outcomes

Unfortunately, the relationship between variability in trust perceptions and outcomes does not follow the patterns that are observed with the expectations components. Trust components are unrelated to the number of bonuses the group receives on the

subsequent game, the number of points contributed or harvested during the games, or any of the social outcomes such as satisfaction or work motivation.

There are some possible reasons why the variances associated with expectations relate well to the task-related outcome measures and the measures of trust do not. The most obvious being that trust is unrelated to outcomes on a task of this nature. Given that this study is the first of its kind to examine the relationship between SRM variances associated with trust perceptions and outcomes, one should be extremely cautious when interpreting null results. There are issues associated with the trust measures that may have impacted the ability to find an effect in this study. Trust was measured on a different time scale than were expectations. Expectations were measured on a round by round basis which means participants could change their expectations at five different points during each game. Trust, on the other hand, was measured at one point before the game. It is possible that if trust had been assessed after every round, we would see relationships to contributions and harvests similar to what is seen with the expectation measures.

Unfortunately, variability in trust perceptions does not relate to contributions or harvests during the social dilemma games. The importance of caution in interpreting this result has already been discussed. However, if variability in trust perceptions ultimately does not relate to behavior the implications are far-reaching. It would demonstrate that variability across trust measures may not be the critical factor when determining behavior at the group level. Instead, it may be that behavior is driven by other factors such as the trust perceptions of the least trusting group member. Under such a scenario, the least trusting member may believe that all other group members will act in a manner against the collective and may not be swayed in that opinion by the behavior of the group members as

they complete the task. Those least trusting group members would then protect themselves from exploitation, contribute little or harvest much, which could engender competition among the other group members and produce a self-fulfilling prophecy.

Even more surprising was the failure of the trust measures to effectively predict the more social outcomes that were measured at the end of the study. It was expected that groups that gain consensus with regard to trust would be more likely to have a predictable experience with the games and would thus report greater quality of relationships and ultimately greater satisfaction. However, recall that increased partner variance indicates that the group members agree that some members of the group are trustworthy whereas others in the group are not. It may be that participating in a task with an untrustworthy group member reduces satisfaction regardless of whether or not all group members agree on which group member is untrustworthy.

The results regarding trust perceptions add a unique twist to our understanding of how trust operates within a group situation and also how trust perceptions can relate to behavior in social dilemmas. The data demonstrate an interesting pattern within trust perceptions in that participants begin the game believing that all group members can be trusted equally. After repeated interactions participants begin to move away from that belief and adopt a more nuanced view of the group in determining which group members can be trusted and which cannot. Group members can form a consensus on which members are deserving of trust relatively quickly given that a diagnostic task is being completed and feedback is provided.

Utility of the Expanded I-P-O Model

The results of the study present a very positive view for the framework of group functioning proposed for this research (Figure 2). Recall that it was proposed that distal inputs–inputs which are indirectly related to the task–would relate to proximal inputs–inputs that are directly related to the task–which would relate to group processes as indexed by the variance components of the social relations model which would relate to outcomes from tasks and interaction. The pattern of results demonstrates a relationship between a distal input, namely collectivism, and the proximal input of contribution or harvest expectations. This relationship exists during the initial stages of the interaction but declines as participants gain more behavioral evidence of what to expect from their interaction partners. The proximally assessed expectations are then translated into meaningful variance components when analyzed using social relations modeling. Actor variance, which represents a tendency for group members to expect similar behavior from all interaction partners, is the primary variance component in expectations during the game. In turn, actor variance is shown to positively relate to the tendency of the group to engage in competitive behavior. The more actor variability is present within the group members' expectations, the more the group tends to act competitively, decreasing contributions in the public goods game and increasing harvests in the resource allocation game.

Results from the assessment of trust perceptions within the group also show interesting results. In general, we find support for a conceptualization of trust with perceptions of benevolence and integrity predicting trustworthiness (Mayer, Davis, & Schoorman, 1995). The data from the present study do not find the final component, ability, as a predictor of trustworthiness. That same conceptualization of trust recommends treating trust as a relationship occurring between two people rather than a disposition

existing within an individual. To test this notion, the social relations model was used to index group perceptions of trust. Results from the SRM analysis demonstrate convincingly that conceptualizing trust as a relationship adds to our understanding of the cognitive antecedents of trust, but does not predict behavior.

The expanded I-P-O model does an adequate job of explaining the pattern of relationships involving trust as well. The distal input, collectivism, tends to relate to SRM effects associated with trust perceptions, particularly during the first assessment of trust before behavioral evidence is gathered by the participants. SRM effects then generate meaningful variability across all of the different facets of trust, though actor variance is the primary source during the first assessments. Partner variance does begin to appear in later assessments of trust as participants learn which group members can be trusted and which cannot. Unfortunately, the final relationship in the model–the link between group processes as indexed by the SRM variance components and outcomes–is not significant.

The expanded I-P-O model demonstrates important utility with regard to predicting and explaining the results obtained with both expectations and perceptions of trust. The model explains how collectivism would relate to the measures of expectations and also adequately predicted that the relationship between collectivism and the SRM effects would dissipate as the study continued.

The study also demonstrates the utility of the social relations model for demonstrating and quantifying aspects of group process. By understanding the nature of how expectations and perceptions are distributed across the group, we gain an understanding of how the group is completing tasks that was not previously available. For example, we are able to see in this study that participants completing a social dilemma with

a group of people with whom they have had minimal contact tend to expect that all group members will behave similarly and that the level of responding is closely tied to expectations for what the self will do.

Finally, the expanded I-P-O model points out the importance of using group process to examine group-level outcomes. The current study achieves this by demonstrating that groups with greater actor variability tend to contribute fewer resources in a public goods dilemma and harvest more resources in a resource allocation dilemma. Essentially, competitive behavior is predicted by whether or not group members have variable expectations for how all group members will respond.

Conclusions

The current study establishes the utility of the expanded I-P-O model, demonstrates the utility of using SRM variance components as indices of group process, and also establishes how collectivism is related to expectations and behavior within a social dilemma. Integrating SRM variance components into the expanded I-P-O model as indices of process allows for a stringent test of the importance of group process in the generation of group level outcomes. Using SRM variance components as indices of group process, this study demonstrates that processes associated with expectations have important implications for whether or not groups will display cooperative or competitive behavior.

The study also shows that collectivism is related to a tendency to expect that all group members would respond similarly during the first iteration of a public goods dilemma. Taken with the finding that actor variance is related to competitive behavior within social dilemmas, it is possible that high collectivism groups would potentially produce more competitive behavior than groups low in collectivism. This would occur

simply because high collectivism individuals tend to have larger actor effects which would create more opportunities for group members to have variability within their actor effects. Our data do not fully show this pattern, with there being no difference in the number of bonuses received between high and low collectivism groups, but the potential may exist in a larger sample of groups or groups with larger differences in collectivism. This potential is likely to dissipate quickly when the groups are provided individualized feedback as the effect disappeared after a single iteration of the game.

This study also establishes an unexpected relationship between trust, expectations, and outcomes of social dilemmas. The assessment of trust was found to be internally consistent with previous conceptualizations of trust. The SRM analysis of the trust measures also shows that participants in the study were systematic with regard to how they rated their group members on the various facets of trust–first rating all group members as similar and later establishing some consensus regarding which members could be trusted and which could not. However, the SRM variance components associated with trust are not shown to predict outcomes in a reliable fashion. Whether this effect is specific to the current task or is a more pervasive finding can only be determined by additional research examining the efficacy of trust in predicting outcomes in different contexts.

By establishing that actor variance is a significant predictor of cooperative and competitive behavior in social dilemmas, the current study demonstrates that variability in expectations is a driving factor when considering whether or not a group will arrive at a cooperative solution to a social dilemma. Thus, a group may arrive at a cooperative solution even though every group member expects all other group members to act competitively. In this way, we might expect that tragedies such as a nuclear attack

occurring as a result of the Cuban Missile Crisis would actually be less likely to occur than some may believe, as long as all parties expect each player to pursue a purely cooperative or purely competitive strategy. The mutually competitive nature of the relationship between the U.S. and Soviet Union may have actually helped avert collective catastrophe by reducing variability in expectations.

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APPENDIX A

The following contains the formulae necessary to calculate the components of the Social Relations Model. The formulae are taken from Kenny (1994). Within the formulae, n = the number of group members, $M_{i.}$ = the mean for perceiver *i* averaged across *n* – 1 targets, $M_{.j}$ = the mean for target *j* averaged across *n* – 1 perceivers and the term $M_{..}$ = the mean across all *n*(*n* – *1*) observations.

The estimate of the actor effect for perceiver *i* is

$$\hat{a}_i = \frac{(n-1)^2}{n(n-2)} M_{i.} + \frac{n-1}{n(n-2)} M_{.i} - \frac{n-1}{n-2} M_{..}$$

The estimate of the partner effect for target *i* is

$$\hat{b}_i = \frac{(n-1)^2}{n(n-2)} M_{.i} + \frac{n-1}{n(n-2)} M_{i.} - \frac{n-1}{n-2} M_{..}$$

The estimate of the relationship effect for perceiver *i*'s rating of target *j* is

$$\widehat{g_{ij}} = X_{ij} - \hat{a}_i - \hat{b}_j - M_{..}$$

These parameters are used to estimate the following mean squares

$$A = \frac{\Sigma \widehat{a_i^2}}{n-1}$$

$$B = \frac{\Sigma \widehat{b_i^2}}{n-1}$$

$$C = \frac{\Sigma \widehat{a_i} \widehat{b_i}}{n-1}$$

The summation is across *n* persons.

For the relationship effects, the average and the difference are defined:

$$\widehat{e_{ij}} = .5(\widehat{g_{ij}} + \widehat{g_{ji}})$$

$$d_{ij} = \widehat{g_{ij}} - \widehat{g_{ji}}$$

Then, summing across the *n*(*n* – 1)/2 dyads, the following mean squares are computed:

$$D = \frac{2\sum \widehat{e_{ij}^2}}{\left[\frac{(n-1)(n-2)}{2}\right]-1}$$

$$E = \frac{\sum \widehat{d_{ij}^2}}{(n-1)(n-2)}$$

The estimate of the relationship variance, or s_g^2, equals

$$\frac{D+E}{2}$$

The estimate of the relationship covariance, or $s_{gg'}$, equals

$$\frac{D-E}{2}$$

The estimate of actor-partner covariance equals

$$C - \frac{s_{gg'}(n-1)}{n(n-2)} - \frac{s_g^2}{n(n-2)}$$

The estimate of the perceiver variance equals

$$A - \frac{s_g^2(n-1)}{n(n-2)} - \frac{s_{gg'}}{n(n-2)}$$

The estimate of the target variance equals

$$B - \frac{s_g^2(n-1)}{n(n-2)} - \frac{s_{gg'}}{n(n-2)}$$

APPENDIX B

Horizontal/Vertical Individualism-Collectivism Scale

Instructions: Please use the accompanying rating scale to indicate how much you agree with each statement. Be as accurate and honest as you can throughout. Remember there are no right or wrong answers.

Scale: 1 – Strongly Disagree, 2 – Disagree, 3 – Slightly Disagree, 4 – Neither Agree nor Disagree, 5 – Slightly Agree, 6 – Agree, 7 – Strongly Disagree

Note: * = Reverse scored item

A. Horizontal Individualism

1. I often do "my own thing"
2. One should live one's life independently of others
3. I like my privacy
4. I prefer to be direct and forthright when discussing with people
5. I am a unique individual
6. What happens to me is my own doing
7. When I succeed, it is usually because of my abilities
8. I enjoy being unique and different from others in many ways

B. Vertical Individualism

1. It annoys me when other people perform better than I do
2. Competition is the law of nature
3. When another person does better than I do, I get tense
4. Without competition, it is not possible to have a good society
5. Winning is everything

6. It is important that I do my job better than others
7. I enjoy working in situations involving competition with others
8. Some people emphasize winning; I am not one of them*

C. Horizontal Collectivism

1. The well-being of my co-workers is important to me
2. If a co-worker gets a prize, I would feel proud
3. If a relative were in financial difficulty, I would help within my means
4. It is important to maintain harmony within my group
5. I like sharing little things with my neighbors
6. I feel good when I cooperate with others
7. My happiness depends very much on the happiness of those around me
8. To me, pleasure is spending time with others

D. Vertical Collectivism

1. I would sacrifice an activity that I enjoy very much if my family did not approve of it
2. I would do what would please my family, even if I detested that activity
3. Before taking a major trip, I consult with most members of my family and many friends
4. I usually sacrifice my self-interest for the benefit of my group
5. Children should be taught to place duty before pleasure
6. I hate to disagree with others in my group
7. We should keep our aging parents with us at home
8. Children should feel honored if their parents receive a distinguished award

APPENDIX C

Trust Measures

Instructions: Think about Group Member #1 (asked for all group members). For each statement, write the number that best describes how much you agree or disagree with each statement.

Scale: 1 – Strongly disagree, 2 – Disagree, 3 – Neither agree nor disagree, 4 – Agree, 5 – Strongly Agree

Note: * indicates reverse scored item

A. Ability

1. Group Member #1 is very capable of performing the task
2. Group Member #1 is successful at the things he/she tries to do
3. Group Member #1 has much knowledge about the game we played
4. I feel very confident about Group Member #1's skills
5. Group Member #1 has specialized skills that can increase our performance
6. Group Member #1 is well qualified

B. Benevolence

1. Group Member #1 is concerned about my welfare
2. My needs and desires are very important to Group Member #1
3. Group Member #1 would not knowingly do anything to hurt me
4. Group Member #1 looks out for what is important to me
5. Group Member #1 will go out of his/her way to help me

C. Integrity

1. Group Member #1 has a strong sense of justice

2. I never have to wonder if Group Member #1 will stick to their word
3. Group Member #1 tries hard to be fair in dealing with others
4. Group Member #1's actions and behaviors are not very consistent*
5. I like Group Member #1's values
6. Sound principles seem to guide Group Member #1's behavior

D. Trustworthiness

1. If I had my way, I wouldn't let Group Member #1 have any influence over issues that are important to me. *
2. I would be willing to let Group Member #1 have complete control over my outcomes in the game
3. I really wish I had a good way to keep an eye on Group Member #1 *
4. I would be comfortable giving Group Member #1 a task or problem that was critical to me, even if I could not monitor their actions

E. Propensity (asked only once)

1. One should be very cautious with strangers *
2. Most experts tell the truth about the limits of their knowledge
3. Most people can be counted on to do what they say they will do
4. These days, you must be alert or someone is likely to take advantage of you*
5. Most salespeople are honest when describing their products
6. Most repair people will not overcharge people who are ignorant of their specialty
7. Most people answer public opinion polls honestly

8. Most adults are competent at their jobs

APPENDIX D

Team Diagnostic Survey Measures

Instructions: Please answer the following questions regarding you group. Please base your answers on both the Survival scenario and the game tasks you completed.

Scale: Highly inaccurate (1) – Highly accurate (5)Note: * indicates reverse scored item

A. Quality of Team Interaction

1. There was a lot of unpleasantness among members of this team.*
2. The longer we worked together as a team, the less well we did.*
3. Working together energized and uplifted members of our team
4. Every time someone attempted to correct a team member whose behavior was not acceptable, things seemed to get worse rather than better.*

B. Satisfaction with Team Relationships

1. My relations with other team members are strained.*
2. I very much enjoyed talking and working with my teammates.
3. The chance to get to know my teammates was one of the best parts of working on this team.

C. Internal Work Motivation

1. I felt a real sense of personal satisfaction when our team did well.
2. I felt bad and unhappy when our team performed poorly.
3. My own feelings were not affected one way or the other by how well our team performed.
4. When our team has done well, I have done well.

D. General Satisfaction

1. I enjoyed the kind of work we did in this team
2. Working on this team was an exercise in frustration. *
3. Generally speaking, I am very satisfied with this team

APPENDIX E

Complete Script of the Study

Parts in normal font *are spoken instructions to the participants. Parts in* **bold** *font are directions to the experimenter. The experimenter reads this script over a public address system to a group of participants seated in a room behind a closed door. Each participant is seated at a computer with the beginning of a computerized survey displayed on the monitor.*

Is everyone here for the Social Relations in Groups study?

Lead the people in and assign everyone to a room. Have everyone take a seat.

Thank you for coming today. Before we begin, there are a couple of things I need to mention. First, as you can see, there are cameras mounted around the room. The purpose of the cameras is to monitor what happens during the experiment so the experimenters can answer any questions that may come up. The cameras are NOT being used to record anything you say or do in the experiment today. In addition, your name will be entered on the consent form for the purposes of attendance records only. Thus, all your responses will remain confidential and your identity will not be associated with your responses in any way.

Now please take some time to read over the consent form. Sign and date the back side if you are willing to participate.

Collect signed consent forms and place them aside

If everyone can hear me, please raise your hand. **<Wait for everyone to raise hands>**

Thank you. Before we begin we want you to know that anyone who is unwilling or unable to participate is free to leave at any time. We assure you that the experiment is in no way

harmful or distasteful, but if anyone should need to leave simply raise your hand to notify the experimenter. Are there any questions so far? **(Pause)** By participating in this study, you are eligible to receive a lottery prize. At the end of the semester, we will draw eight people as winners of our lottery. The number of entries into the lottery you receive will be based on your performance during the study. The better you do the more chances you will have to receive a prize. There are two $100 prizes and six $50 prizes available, so be sure to try your hardest during the tasks.

In today's experiment we will be asking you to complete a number of tasks with your group. More instructions regarding each task will be given later, but each task will involve you interacting with your group in some way. Before you complete these tasks, you will respond to a number of surveys. You will respond to all the surveys using the computer you are seated at. After you answer one question, the computer will automatically prompt the next question and you will not be able to go back so make sure to read each question and choose your answer carefully.

Now please enter the word CAT, C-A-T into the password field and click "Continue" on the lower right hand corner of the screen to begin the surveys. If you have any questions simply raise your hand and I will come around to help. Continue to answer the questions until you come to a page that has a large stop sign on it.

Participants begin answering questions. There are eight different surveys they will respond to. Wait until all group members in all rooms arrive at the Stop Sign Screen before moving on.

We will now begin the group tasks. This first task will NOT count toward your chances to win the lottery. On the next screen there will be a page of instructions. Please read

through these instructions as I read them aloud. To continue, enter the word "fly" F-L-Y into the password field and click "Continue".

This exercise is designed for you to get to know your group members a little better. During this team-building exercise, interaction with your group members is encouraged.

The team-building exercise will consist of the entire group attempting to solve a problem in which you will rank items from Most Important to Least Important. You will rank the items by dragging the items from the purple section of the screen to the green section of the screen.

The scenario you and your group members will be experiencing will pop up in a separate window. You can view this information at any time by clicking on "Instructions" at the bottom of the screen.

Even though each person will be responding to these items, you MUST come to agreement as a group regarding the ranking of the items. You will have 10 minutes to complete this task. If you have any questions, please raise your hand and I will be around to answer them. When you are ready to begin, click on the "Continue" button.

As the participants complete this task, get the dividers ready to be put in place. Set them outside the door of each room so they are ready to go. Once everyone is at the Stop Sign screen, put the dividers in place.

The next screen contains a page of instructions. Please follow along as I read them aloud. Enter the word "sky", S-K-Y and click on Continue.

In our next task, you will be playing a game with the members of your group. During this task, you CANNOT communicate with your group members. Notice that dividers have been put in place for this purpose.

During this task, you will accumulate points for yourself. These points have value. For every 100 points you accumulate, you will receive a raffle ticket good for one entry in the lottery. Lottery prizes will be two $100 prizes and six $50 prizes. The more points you accumulate, the more entries into the lottery you will receive. Please click "Continue".

The game will consist of a number of rounds. During each round, each group member will be asked if they want to contribute points to the Public Good.

Points that are contributed to the Public Good WILL NOT be returned. If the total number of points contributed by all group members is 125 or greater, everyone in the group will receive a bonus of 75 points. Everyone in the group will receive the bonus regardless of how many points each person contributed to the Public Good.

You will receive 125 points to start the game and will be able to contribute up to 50 points each round. The points you earn will carry over from round to round and the total points you have at the end of all rounds will be used to determine how many raffle tickets you earn.

The following pages contain examples that will explain more about the game and also test your understanding of the rules. Please read through the examples and answer all questions. Some questions will refer to members of your group by number. The numbers attached to the wall behind each person indicate which group member they are. Thus, the person with the "1" behind them is Group Member #1, and so on. Once everyone is at the Password screen, we will begin.

What will follow now will be a series of 5 rounds in which you will call each group member, one at a time, to go to Computer #5 to make their response. After each round, you will display the results to all computers via NetSupport.

We will now begin the next group task. Remember, this task WILL count towards your entries in the lottery. For every 100 points you accumulate, you will receive one lottery entry. To complete this task, each group member will move to Computer #5, one at a time, and give their response. You will be called based on the number attached to the wall behind you. After all group members have given their response, the results of the round will be displayed to you on your computer. Now, Group Member #1, please move to computer #5 and give your response. <**If they don't immediately go back to their computer after responding say:** After you have given your response, please return to your seat.> Group Member #2, please move to computer #5 and give your response. Group Member #3, please move to computer #5 and give your response. Group Member #4, please move to computer #5 and give your response. <**After Group Member #4 sits down>** We will now display the results. **In NetSupport, right click on the computer corresponding to #5 (check the monitor for the computer labeled "Response Computer"). In the dropdown menu, select Exhibit this Client. Give them 10-15 seconds to view the responses. Click "Continue" on the bottom. Give another 10 seconds to view this information. To end showing the participants the results press the Stop Button.**

That concludes Round 1. Before we begin Round 2, please answer the following questions on your computer. Enter the letters "R-O-U-N-D" and the number "2" into the password field and press enter. Make sure you do NOT enter a space between the letters and the

numbers. Continue to answer the questions until you come to the password screen. **They answer the questions. Wait until all participants in all rooms are at the Stop Sign.**

We will now begin Round 2. Round 2 will proceed in the same manner as Round 1. Group Member #1, please move to computer #5 and give your response. <**If they don't immediately go back to their computer after responding say:** After you have given your response, please return to your seat.> Group Member #2, please move to computer #5 and give your response. Group Member #3, please move to computer #5 and give your response. Group Member #4, please move to computer #5 and give your response. <**After Group Member #4 sits down**> We will now display the results. **In NetSupport, right click on the computer corresponding to #5. In the dropdown menu, select Exhibit this Client. Give them 10-15 seconds to view the responses. "Continue" on the bottom. Give another 10 seconds to view this information. To end showing the participants the results press the Stop Button.**

Before we begin Round 3, please answer the following questions on your computer. Enter the letters "R-O-U-N-D" and the number "3" into the password field and press enter. Make sure you do NOT enter a space between the letters and the numbers. Continue to answer the questions until you come to the password screen. **They answer the questions. Wait until all participants in all rooms are at the Stop Sign.**

We will now begin Round 3. Round 3 will proceed in the same manner as the other rounds. Group Member #1, please move to computer #5 and give your response. <**If they don't immediately go back to their computer after responding say:** After you have given your response, please return to your seat.> Group Member #2, please move to computer #5 and give your response. Group Member #3, please move to computer #5 and

give your response. Group Member #4, please move to computer #5 and give your response. **<After Group Member #4 sits down>** We will now display the results. **In NetSupport, right click on the computer corresponding to #5. In the dropdown menu, select Exhibit this Client. Give them 10-15 seconds to view the responses. Click "Continue" on the bottom. Give another 10 seconds to view this information. To end showing the participants the results press the Stop Button.**

Before we begin Round 4, please answer the following questions on your computer. Enter the letters "R-O-U-N-D" and the number "4" into the password field and press enter. Continue to answer the questions until you come to the password screen. **They answer the questions. Wait until all participants in all rooms are at the Stop Sign.**

We will now begin Round 4. Group Member #1, please move to computer #5 and give your response. **<If they don't immediately go back to their computer after responding say:** After you have given your response, please return to your seat.> Group Member #2, please move to computer #5 and give your response. Group Member #3, please move to computer #5 and give your response. Group Member #4, please move to computer #5 and give your response. **<After Group Member #4 sits down>** We will now display the results. **In NetSupport, right click on the computer corresponding to #5. In the dropdown menu, select Exhibit this Client. Give them 10-15 seconds to view the responses. Click "Continue" on the bottom. Give another 10 seconds to view this information. To end showing the participants the results press the Stop Button.**

Before we begin Round 5, please answer the following questions on your computer. Enter the letters "R-O-U-N-D" and the number "5" into the password field and press enter.

Continue to answer the questions until you come to the password screen. **They answer the questions. Wait until all participants in all rooms are at the Stop Sign.**

We will now begin Round 5. Group Member #1, please move to computer #5 and give your response. **<If they don't immediately go back to their computer after responding say:** After you have given your response, please return to your seat.> Group Member #2, please move to computer #5 and give your response. Group Member #3, please move to computer #5 and give your response. Group Member #4, please move to computer #5 and give your response. **<After Group Member #4 sits down>** We will now display the results. **In NetSupport, right click on the computer corresponding to #5. In the dropdown menu, select Exhibit this Client. Give them 10-15 seconds to view the responses. Click "Continue" on the bottom. Give another 10 seconds to view this information.**

This is the end of this task. Please review your total scores. Remember that every 100 points you accumulated are worth 1 entry into the lottery. **To end showing the participants the results press the stop button.**

Before we begin the next task, please answer the following questions. Enter the word "END E-N-D" in the password field to begin. Continue answering questions until you come to the Stop Sign.

We will now begin the next task. This task will be similar to the one you just completed, but the rules will be slightly different. Please enter the word "SKY S-K-Y" into the password field and read through the instructions as I read them aloud.

In our next task, you will be playing a game with the members of your group. During this task, you CANNOT communicate with your group members.

During this task, you will accumulate points for yourself. These points have value. For every 100 points you accumulate, you will receive a raffle ticket good for one entry in the lottery. Lottery prizes will be two $100 prizes and six $50 prizes. The more points you accumulate, the more entries into the lottery you will receive. Please click "Continue".

The game will consist of a number of rounds. During each round, each group member will be asked if they want to harvest points from a Central Resource Pool.

Points harvested from the Central Resource Pool can never be returned to the pool. If the total number of points harvested by all group members is 75 or less, everyone in the group will receive a bonus of 75 points. Everyone in the group will receive the bonus regardless of how many points each person harvested from the Central Resource Pool.

The pool will contain 500 points to start the game. You will be able to harvest up to 50 points each round. The points you earn will carry over from round to round and the total points you have at the end of all rounds will be used to determine how many raffle tickets you earn. Every 100 points you earn will be worth 1 entry into the lottery.

The following pages contain examples that will explain more about the game and also test your understanding of the rules. Please read through the examples and answer all questions.

Wait for them to arrive at the Stop Sign screen.

We will now begin the next group task. Remember, this task WILL count towards your entries in the lottery. For every 100 points you accumulate, you will receive one lottery entry. To complete this task, each group member will move to Computer #5, one at a time, and give their response. After all group members have given their response, the results of

the round will be displayed to you on your computer. Now, Group Member #1, please move to computer #5 and give your response. **<If they don't immediately go back to their computer after responding say:** After you have given your response, please return to your seat.> Group Member #2, please move to computer #5 and give your response. Group Member #3, please move to computer #5 and give your response. Group Member #4, please move to computer #5 and give your response. **<After Group Member #4 sits down>** We will now display the results. **In NetSupport, right click on the computer corresponding to #5. In the dropdown menu, select Exhibit this Client. Give them 10-15 seconds to view the responses. Click "Continue" on the bottom. Give another 10 seconds to view this information. To end showing the participants the results press the Stop Button.**

Before we begin Round 2, please answer the following questions on your computer. Enter the letters "R-O-U-N-D" and the number "2" into the password field and press enter. Make sure you do NOT enter a space between the letters and the numbers. Continue to answer the questions until you come to the password screen. **They answer the questions. Wait until all participants in all rooms are at the Stop Sign.**

We will now begin Round 2. Round 2 will proceed in the same manner as Round 1. Group Member #1, please move to computer #5 and give your response. **<If they don't immediately go back to their computer after responding say:** After you have given your response, please return to your seat.> Group Member #2, please move to computer #5 and give your response. Group Member #3, please move to computer #5 and give your response. Group Member #4, please move to computer #5 and give your response. **<After Group Member #4 sits down>** We will now display the results. **In NetSupport, right**

click on the computer corresponding to #5. In the dropdown menu, select Exhibit this Client. Give them 10-15 seconds to view the responses. Click "Continue" on the bottom. Give another 10 seconds to view this information. To end showing the participants the results press the Stop Button.

Before we begin Round 3, please answer the following questions on your computer. Enter the letters "R-O-U-N-D" and the number "3" into the password field and press enter. Make sure you do NOT enter a space between the letters and the numbers. Continue to answer the questions until you come to the password screen. **They answer the questions. Wait until all participants in all rooms are at the Stop Sign.**

We will now begin Round 3. Round 3 will proceed in the same manner as the other rounds. Group Member #1, please move to computer #5 and give your response. **<If they don't immediately go back to their computer after responding say:** After you have given your response, please return to your seat.> Group Member #2, please move to computer #5 and give your response. Group Member #3, please move to computer #5 and give your response. Group Member #4, please move to computer #5 and give your response. **<After Group Member #4 sits down>** We will now display the results. **In NetSupport, right click on the computer corresponding to #5. In the dropdown menu, select Exhibit this Client. Give them 10-15 seconds to view the responses. Click "Continue" on the bottom. Give another 10 seconds to view this information. To end showing the participants the results press the Stop Button.**

Before we begin Round 4, please answer the following questions on your computer. Enter the letters "R-O-U-N-D" and the number "4" into the password field and press enter.

Continue to answer the questions until you come to the password screen. **They answer the questions. Wait until all participants in all rooms are at the Stop Sign.**

We will now begin Round 4. Group Member #1, please move to computer #5 and give your response. <**If they don't immediately go back to their computer after responding say:** After you have given your response, please return to your seat.> Group Member #2, please move to computer #5 and give your response. Group Member #3, please move to computer #5 and give your response. Group Member #4, please move to computer #5 and give your response. <**After Group Member #4 sits down**> We will now display the results. **In NetSupport, right click on the computer corresponding to #5. In the dropdown menu, select Exhibit this Client. Give them 10-15 seconds to view the responses. Click "Continue" on the bottom. Give another 10 seconds to view this information. To end showing the participants the results press the Stop Button.**

Before we begin Round 5, please answer the following questions on your computer. Enter the letters "R-O-U-N-D" and the number "5" into the password field and press enter. Continue to answer the questions until you come to the password screen. **They answer the questions. Wait until all participants in all rooms are at the Stop Sign.**

We will now begin Round 5. Group Member #1, please move to computer #5 and give your response. <**If they don't immediately go back to their computer after responding say:** After you have given your response, please return to your seat.> Group Member #2, please move to computer #5 and give your response. Group Member #3, please move to computer #5 and give your response. Group Member #4, please move to computer #5 and give your response. <**After Group Member #4 sits down**> We will now display the results. **In NetSupport, right click on the computer corresponding to #5. In the**

dropdown menu, select Exhibit this Client. Give them 10-15 seconds to view the responses. Click "Continue" on the bottom. Give another 10 seconds to view this information.

This is the end of this task. Please review your total scores. Remember that every 100 points you accumulated are worth 1 entry into the lottery. **To end showing the participants the results press the Stop Button.**

Please answer the following questions. Enter the word "END E-N-D" in the password field to begin. Continue answering questions until you come to the Stop Sign.

That is all the questions we will have you answer today. I will give a brief overview of the research to everyone. If anyone has any specific questions, please see me after the study. You have all earned 6 credit points for your participation today.

The purpose of our study is to understand how expectations regarding other people's behavior relate to your own behavior, as well as to understand how correct or incorrect expectations can change outcomes for the entire group. We hope to understand the factors that create the most points generated for the entire group.

Because we are still in the process of collecting data, there are a couple aspects of the study we would like you to NOT mention if you discuss the study with other people. Specifically, if you could not discuss the rules of the final two games that were played as well as any strategies you may have used while playing the game. If others were to come into the study with this knowledge, it could skew our results. (Get some sort of acknowledgement from everyone). That is the end of the study. If there are any specific questions or if you would like a blank copy of the consent form, please see me. Thank you for participating.

APPENDIX F

Informed Consent Form

Consent to Participate in Research
Social Relations in Groups

This study is being conducted by:
Verlin B. Hinsz, Ph.D., a North Dakota State University psychology professor and Jared Ladbury, a North Dakota State University graduate student in psychology.

Why am I being asked to take part in this research study?
You have been selected because you are at least 18 years of age and signed up for this experiment with the Department of Psychology SONA Systems website.

What is the reason for doing the study?
This study will examine how people use different strategies while working in groups. We hope to understand the strategies different groups may use to complete the task, why those groups use those strategies, and which strategies lead to the best outcome for the group.

Where is the study going to take place, and how long will it take?
This study will be completed in room 101 of Minard Hall. It will take between 45 and 90 minutes to complete

What are the risks and discomforts?
There are no potential risks or discomforts associated with this study.

What are the benefits to me?
You may increase your understanding of judgments in social situations through participation in this study.

What are the benefits to other people?
Your participation in this study will help us understand how peoples' motives influence social judgments and behaviors.

Do I have to take part in the study?
Your participation in this research is your choice. If you decide to participate in the study, you may change your mind and stop participating at any time without penalty or loss of benefits to which you are already entitled.

What are the alternatives to being in this research study?
Your individual psychology instructor provides alternatives to study participation for course credit. See your course syllabus for more information.

Who will see the information that I give?

We will keep private all research records that identify you. Your information will be combined with information from other people taking part in the study. When we write about the study, we will write about the combined information that we have gathered. You will not be identified in these written materials. We may publish the results of the study; however, we will keep your name and other identifying information private.

Will I receive any compensation for taking part in this study?
You will receive 1 point of credit for every 15 minutes of participation in this study. Since completing the study will take 45-90 minutes, you can earn anywhere between 3 and 6 points for completing this study, with the average being 4. In addition, you will have the opportunity to earn entries into a lottery. The more points you accumulate during the task, the more chances you will have to win a lottery prize. Lottery prizes will consist of two $100 prizes and six $50 prizes.

What if I have questions?
Before you decide whether to accept this invitation to take part in the research study, please consult the experimenter if you have questions now. If you have questions after the study is completed, please contact Verlin Hinsz at Verlin.Hinsz@ndsu.edu or Jared Ladbury at jared.ladbury@nsdu.edu.

What are my rights as a research participant?
You have rights as a participant in research. If you have questions about your rights, or complaints about this research you may talk to the researcher or contact the NDSU Institutional Review Board (IRB) by

Telephone: 701.231.8908
Email: ndsu.irb@ndsu.edu
Mail: NDSU Institutional Review Board,
1735 NDSU Research Park Dr.,
Fargo, ND 58105

The role of the IRB is to see that your rights are protected in this research; more information about your rights can be found at: www.ndsu.edu/research/irb .

Documentation of Informed Consent:
You are freely making a decision whether to be in this research study. Completing the information below indicates

you have read and understood this consent form
you have had your questions answered, and
you have decided to be in the study.

Signature of Participant	Date	Participant Name (Please Print)
Signature of Investigator	Date	Investigator Name (Please Print)

APPENDIX G

Survival Simulation Game

You and your group members have just survived the crash of a small plane. Both the pilot and co-pilot were killed in the crash. It is mid-January and you are in Northern Canada. The daily temperature is 25 below zero and the night time temperature is 40 below zero. There is snow on the ground and the countryside is wooded with several creeks crisscrossing the area. The nearest town is 20 miles away. You are all dressed in city clothes appropriate for a business meeting. Your group of survivors managed to salvage the following items:

A ball of steel wool

A small ax

A loaded .45-caliber pistol

Can of Crisco shortening

Newspapers (one per person)

Cigarette lighter (without fluid)

Extra shirt and pants for each survivor

20 x 20 ft. piece of heavy-duty canvas

A sectional air map made of plastic

One quart of 100-proof whiskey

A compass

Family-size chocolate bars (one per person)

Your task as a group is to list the above 12 items in order of importance for your survival. You MUST come to agreement as a group.